Capital Market Implications of Resource Consent Information in New Zealand Listed Company Announcements

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Abstract

This thesis investigates the capital market impact of resource consent information disclosed in New Zealand listed company announcements from 1991 to 2007. Since 1991, New Zealand environmental law has required individuals and businesses to obtain resource consent approval to use resources or undertake development activities that may have potentially adverse environmental impacts. Wide-spread criticisms of excessive delays, uncertainties and compliance costs purportedly caused by the consenting process have motivated this study of the economic implications to New Zealand listed companies of resource consent information. This study adds to the New Zealand capital market literature, employing an event study approach that allows for rigorous, empirical testing of small samples that are problematic in small economy research.

The impact of environmental regulatory delay on capital market reactions to capital expenditure announcements is investigated. A measure of the expected time to gain resource consent (regulatory) approval is developed and used as an indicator of expected resource consent compliance costs. The event study results indicate positive valuation effects from project announcements when the expected time to gain resource consent approval is long. The key findings imply that by undertaking voluntary capital expenditures with high environmental compliance costs, listed companies can create strategic advantages. The results also suggest that if New Zealand legislators are able to reduce environmental regulatory delays associated with capital expenditures through further legislative changes, then the opportunity for firms to earn economic profits may be diminished.

Investor access to timely, financial resource consent information is argued to be problematic, consequently further investigations consider the capital market impact of announcements to the stock exchange that disseminate information on the progress of resource consent applications. The event study results indicate that resource consent announcements are newsworthy and provide timely, valuable information to the market. Further evidence suggests that media dissemination plays an important role in the price-adjustment process for news of resource consent successes. Given the

prominence of environmental compliance issues for firms, the results of this thesis underscore the importance of timely disclosures of firm environmental risk management strategies and processes through stock exchange and press releases.

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Chapter 1: Introduction

1.1 Introduction

This thesis investigates the capital market impact of resource consent information disclosed in announcements by New Zealand (NZ) listed companies. The capital market impact is assessed by studying the NZ stock market reaction to announcements by NZ listed companies of their progress in gaining NZ environmental regulatory approval to undertake major capital expenditure projects. The purpose is to assess the economic implications of such information. As will be explained later in this thesis, the wealth impact of environmental compliance processes on capital expenditure decision-making is important to businesses and their investors. Accordingly, the objective of this thesis is to investigate the capital market impact of NZ resource consent announcements in order to shed light on the economic implications for NZ listed companies.

Section 1.2 of this chapter commences with an outline of background information regarding NZ environmental regulation and a discussion of the controversies with respect to the process for gaining environmental approval to undertake major capital expenditures. This provides the motivation for this thesis. Section 1.3 indicates that while past academic literature on environmental regulation and disclosures offers some insights into the debated issues, it fails to effectively resolve them. Accordingly, two research aims are presented to address the thesis objective. Section 1.4 highlights some of the academic and practical contributions of this thesis. The chapter concludes with an outline of the thesis organisation.

1.2 Background and motivation

Environmental regulations perform an important role in balancing the potential conflicts between industrial development and social interests. Environmental reform in New Zealand in the 1980s was conceived against a backdrop of increased international awareness of environmental issues and a ‘green’ impetus to resolve problems caused by environmental degradation. A series of international conferences and commissions during the 1970s and 80s, including the 1971 United Nations Conference on the

Human Environment in Stockholm and the World Commission on Environment and Development 1987, are credited with focusing New Zealand and international attention on the environment and sustainability (Grundy & Gleeson, 1996). During this time, 'command and control' environmental laws in Anglo-Saxon countries were often criticised as inefficient and costly, while neo-liberal ideologies that emphasised free-markets and de-regulation were increasingly embraced (Gunningham, 2009).

The Resource Management Act (RMA, 1991) was introduced in an effort to promote sustainable management of New Zealand's resources and to control potentially adverse environmental effects of activities on land, air and water. The legislation requires individuals and businesses to apply for resource consent approval prior to using resources or undertaking development activities that may have potentially detrimental environmental impacts. Governance over the use of resources is devolved to regional and local bodies, so multiple consents may be required to allow major investment projects to proceed when more than one jurisdiction or type of resource is affected. Once granted, resource consents are only transferable as part of the project assets. An exception to this is water rights, but in practice their tradability is limited.

Notwithstanding a dearth of empirical research on the business impacts of the RMA, the resource consent process has provoked a considerable amount of controversy. Consent processes have been criticised as inconsistent and costly because local consent authorities lacked the funding, policy guidance and expertise needed to ensure efficient administration (Ministerial Panel on Business Compliance Costs, 2001; OECD, 1996, 2007). Councils are argued to have overstepped their authority and been overly risk averse when considering resource consents (Upton, 1997a). Furthermore, nuisance objectors and trade competitors are said to have unduly delayed the consultative stages of consent processes (Ernst & Young, 1997; Ministerial Panel on Business Compliance Costs, 2001). Some research evidence appears to support the view that protracted resource consent processes may have inhibited business investment from the early 1990s to 2001 (Clough, 2005; Wilkinson, 2001).

Many of the above problems have been blamed as the cause of onerous compliance costs to NZ businesses, but few studies have attempted to measure them. Furthermore, there appear to be impediments to the disclosure of environmental compliance costs through annual financial reports. Resource consent costs are not required to be separately identified in NZ company reports, and are either expensed if they fail to meet the asset test, or capitalised with the project assets. Tozer and

Hawkes (2001) reveal that out of 24 New Zealand companies surveyed that held resource consents, only one reported them separately in the financial statements. In the US steel industry, research suggests that the ratio of indirect to direct environmental compliance costs is approximately 10:1, with only direct costs being separately identified in the accounting system (Joshi, Krishnan, & Lave, 2001).

Taken together, the above discussion implies that while resource consent costs may be particularly material, businesses and their investors may face a challenge to identify their financial implications. Nevertheless, listed companies make announcements concerning resource consents to the New Zealand Exchange (NZX) and the stock market reactions to these disclosures may provide economic insights. Accordingly, the objective of this thesis is as follows:

Thesis objective: To investigate the capital market impact of resource consent information disclosed in New Zealand listed company announcements in order to shed light on the economic implications to New Zealand listed companies.

This objective has several implications with respect to the scope of this study. Firstly, this thesis focuses upon economic implications to NZ listed companies, rather than the social costs and benefits of economic regulations, which may be considerable. Furthermore, the majority of resource consent applications are from individuals and non-publicly listed businesses and organisations, yet these will not be scrutinised in this thesis due to data limitations. Accordingly, this study focuses upon stock market reactions to announcements by New Zealand listed companies. Also beyond the scope of this thesis is the measurement of the economic implications of non-announced potential investment opportunities foregone as a consequence of the RMA legislation and/or the resource consent process. Furthermore, the thesis objective permits an examination of the resource consent process, which is a requirement of the RMA legislation that affects the capital expenditure decisions of many listed companies. However, an examination of the capital market impact of the entire RMA legislation is considered to be beyond the scope of this thesis. Finally, while the results of this study may well be of interest to regulators, a full analysis of the public policy implications is not undertaken.

1.3 Research aims

The intuition behind measuring the capital market impact of announcements is rooted in financial valuation theory. Miller and Modigliani (1961) describe the investment opportunities approach to share valuation, where the market value of the firm is equal to the present value of earnings on currently owned assets plus the present value of future investment opportunities. If stock markets are informationally efficient (Fama, 1970, 1991), then the value of new, positive net present value (NPV) projects are quickly impounded into the stock prices of firms. Resource consent activities relating to a given project tend to precede any related tangible investment in income-producing capital assets. Consequently, news of a project initiation for which resource consent approval is being sought will result in a change in the firm's stock price and the market value of the firm's equity according to investors' expectations of the project's NPV. The present value of future investment opportunities may change if the firm's profitability, as measured by future cash flows, is expected to change.

The criticisms raised of excessive resource consent compliance costs and uncertainties for businesses that undertake capital expenditures are consistent with the neoclassical economics view that environmental regulations impose a net cost upon businesses. According to this view, environmental capital expenditures for pollution abatement are likely to result in either negative returns to firms, or at least returns that are substantially lower than are possible from other investments (e.g. Palmer, Oates, & Portney, 1995; Walley & Whitehead, 1994). In contrast, the 'Porter hypothesis' (Porter & van der Linde, 1995) suggests that firms may be able to gain net economic benefits through well-designed environmental regulations that encourage resource productivity, enhance innovation and improve competitiveness. To shed light on this debate, the first research aim for this thesis is as follows:

Research aim 1: To examine the impact of environmental regulatory delay on New Zealand capital market reactions to capital expenditure announcements by New Zealand listed companies.

To achieve this aim, three testable hypotheses are proposed. The first hypothesis involves the construction and testing of a measure of expected regulatory delay, being the expected time for each project to obtain resource consent approval. This measure is argued to be an indicator of expected resource consent compliance costs. The next two hypotheses then test the shareholder wealth maximisation and rational

expectations hypotheses to assess the influence of expected resource consent compliance costs on the stock market reaction to project initiation announcements.

Investor access to timely, financial resource consent information is argued to be problematic, consequently further investigations consider the capital market impact of announcements to the stock exchange that disseminate information of the progress of resource consents. If such announcements cause investors to revise their expectations of the amount or risk of future project cash flows, then changes in firm value will be observable through changes in the firm's stock price. Some resource consent announcements are expected to be interpreted as good news, such as when an Environment Court appeal against a resource consent is dismissed, or when resource consent approval has been secured to allow an important investment project to proceed. At such stages, regulatory compliance costs are largely sunk, so an observation of stock price increases would be evidence of perceptions of positive changes in value associated with the event. However, news of delays, appeals and monitoring in connection with project resource consents imply an increase in expected compliance costs, and may result in negative share price reactions and/or increased share price volatility if project net present values are expected to be negatively affected through delayed, diminished or riskier future cash flows. Given that the financial dollar cost of the resource consent process is rarely disclosed through any medium, the overwhelmingly qualitative nature of the disclosures may hamper investors' abilities to interpret the financial impact of resource consent announcements (Moneva & Cuellar, 2009). Uncertainty surrounding resource consent information could contribute to increased return volatility and correspondingly higher costs of capital for businesses.

Turning to the academic literature, heightened social awareness of environmental concerns and increasingly stringent environmental legislation have motivated researchers to consider the relevance to investors of firm-specific environmental disclosures (Berthelot, Cormier, & Magnan, 2003). Environmental information dissemination may reduce information asymmetry problems such as adverse selection and moral hazards that impede market efficiency. Adverse selection is a problem if managers of companies most vulnerable to environmental risks fail to disclose their risk exposure, while moral hazards may allow managers to exploit their knowledge to the disadvantage of investors (Berthelot et al., 2003). Hence, announcements of resource consent news may provide investors with useful and timely information that is incremental to information available through other sources. Yet, despite the controversy of excessive delays and compliance costs in connection with obtaining

resource consents, no research evidence exists of the relevance to investors of resource consent information conveyed in announcements by New Zealand listed companies.

This motivates the second key research aim of this thesis:

Research aim 2: To investigate the New Zealand capital market impact of resource consent announcements by New Zealand listed companies

To meet the second key research aim, seven hypotheses are proposed. The first three hypotheses test the information content of resource consent announcements, and then the next four hypotheses test their economic impact. The investigation of these hypotheses requires the identification of listed company announcements that disseminate information of the progress of resource consents, including news from the planning stages through to disclosures of the resolution of appeals opposed to resource consent approval.

1.4 Contributions of the research

Differences in industrial structure and the regulatory environment may prevent the generalisation of large-economy research results to small economies. This study adds to the scant New Zealand capital market literature, employing an event study approach that allows for rigorous, empirical testing of small samples that are problematic in small economy research. The methodological approach described in this thesis, including the construction of equal-weighted market indices and the use of robust, non-parametric statistics such as the Corrado and Zivney (1992) variance-adjusted rank test, may help to encourage other finance researchers to engage in small-economy capital markets research.

Another key contribution of this thesis is the development of a measure of expected regulatory delay as an indicator of environmental compliance costs. As highlighted previously, identifying and measuring regulatory compliance costs can be difficult, as indirect costs are not normally separately identifiable through accounting records. In this thesis, an indicator of environmental compliance costs at the time of new capital expenditure announcements is developed and found to be positively related to future environmental regulatory delay. This offers a possible approach to address the criticism

that previous studies fail to control for costs of delays and litigation caused by environmental regulation (Jaffe, Peterson, Portney, & Stavins, 1995). Furthermore, relative to compliance cost surveys that only measure costs, this study has the advantage of allowing insights into net benefits at the project-level by focusing on capital expenditure announcements. The findings reported in this thesis have important implications not only for businesses, but also for environmental regulatory authorities who are charged with the difficult responsibility of balancing business and social interests.

The academic literature on the economic effects of environmental regulation is also extended in this study. The tests in this thesis of the shareholder wealth maximisation and rational expectations hypotheses allow an assessment of the influence of expected resource consent compliance costs on the stock market reaction to project initiation announcements. In the debate with respect to environmental compliance costs, the neo-classical view assumes that environmental regulations impose net costs on firms (Walley & Whitehead, 1994), while the Porter hypothesis (Porter & van der Linde, 1995) suggests that net benefits are possible. This thesis presents evidence that not only sheds light on this academic controversy, but also has important implications for NZ capital expenditure decision-making.

The investigation of the capital market impact of New Zealand resource consent information adds to the growing literature on the role of environmental disclosures in disseminating information. The thesis findings suggest that resource consent announcements transmit valuable information to the markets regarding future regulatory compliance costs, and in doing so, play an economically valuable role in reducing information asymmetry. Media dissemination is shown to play an important role in the price-adjustment process for news of resource consent successes. Given the prominence of environmental compliance issues for firms, the results of this thesis underscore the importance of timely disclosures of firm environmental risk management strategies and processes through stock exchange and press releases.

1.5 Organisation of the thesis

The structure of the thesis is outlined as follows. Chapter 2 describes the institutional background, introducing the RMA and the resource consent requirements. The criticisms of excessively high compliance costs and uncertainties associated with the

resource consent process are then discussed, followed by an overview of the legislative attempts to address the criticisms. The disclosure environment for resource consent information and the potential implications for businesses and investors are then outlined.

Chapter 3 overviews the economic regulation, capital investment and capital markets literature that is most relevant to the thesis, organised in the order of the two research aims. For research aim one, the theory and evidence with respect to the alternate views of environmental regulation as a source of net costs or net benefits is overviewed, and then selected literature on the shareholder wealth implications of capital expenditures is discussed. Then to address research aim two, the next section presents a synthesis of selected research on the short-horizon capital market reactions to firm-specific announcements.

Hypotheses, data and methodology are discussed in Chapters 4 and 5. Chapter 4 introduces the hypotheses to be tested to meet the two research aims regarding the capital market implications of resource consent information. The rationale for the choice of methodologies is explained and then the data, data sources and sampling procedures are discussed. Next, Chapter 5 presents details of the event study and cross-sectional regression methodologies used to test the thesis hypotheses.

The empirical results from the tests of the research hypotheses are presented and discussed in Chapters 6 and 7. To address research aim one, Chapter 6 presents empirical evidence of the impact of regulatory delay on capital market reactions to project initiation announcements. Then to address research aim two, Chapter 7 examines the results from tests of the capital market impact of resource consent announcements. In Chapter 8, the research aims, hypotheses and major findings of the thesis are summarised and the major conclusions are discussed. The main contributions of the thesis are then explained. Chapter 8 concludes by identifying the limitations of the study and suggesting areas for further research.

Chapter 2: Institutional background

2.1 Introduction

This chapter introduces the Resource Management Act 1991 (RMA) and its resource consent requirements. The nature of business-related criticisms surrounding the RMA will be discussed, focussing primarily on topical issues relating to the resource consent process. Attempts to address these criticisms through amendments to the RMA are then outlined. The chapter then describes the disclosure environment for resource consent information, and concludes with some discussion of the corporate implications of such disclosures. Discussion of the academic literature on the economic effects of environmental regulation follows in Chapter 3.

2.2 Resource Management Act 1991

During the 1980s, 'command and control' environmental laws in Anglo-Saxon countries were increasingly criticised as inefficient and costly in favour of neo-liberal ideologies that emphasised free-markets and de-regulation (Gunningham, 2009). From this backdrop, environmental reform in New Zealand through-out the 1980s and 1990s sought to integrate the previously uncoordinated, diverse and at times conflicting land use and environmental statutes (Robertson, 1993). The result was an attempt to legislate in a single statute the Resource Management Act 1991, to integrate the environmental management and resource planning for land, air and water.

In contrast to earlier statute law that regulated development *activities* directly through urban planning, the political intent of the RMA legislation was to exert control over potentially adverse environmental *effects* of such activities (Grundy & Gleeson, 1996). The economic underpinning is the Coase Theorem, which implies that efficient utilisation of resources can be achieved when transactions costs are minimal and property rights are able to be defined and appropriately allocated (Coase, 1960). Environmental regulation is considered appropriate when market failures would otherwise lead to externalities with respect to public goods, such as air pollution (S. Kerr, Claridge, & Milicich, 1998). As such, primary economic functions of the RMA

include the allocation and exercise of property rights (Easton, 1998). Hence the premise of the RMA is that people should be permitted to provide for their wellbeing, allowing for the use of air, land and water unless it contravenes rules in plans (Pardy, 1997).

At the time of its introduction in 1991, the RMA was at the forefront of international trends to promote sustainability as a goal (Wood, Tanner, & Richardson, 2010). S5(1) describes the purpose of the Act being "to promote the sustainable management of natural and physical resources" (Resource Management Act 1991, s5(1)). Sustainable management is defined as:

> managing the use, development, and protection of natural and physical resources in a way, or at a rate, which enables people and communities to provide for their social, economic, and cultural wellbeing and for their health and safety while-
> (a) sustaining the potential of natural and physical resources (excluding minerals) to meet the reasonably foreseeable needs of future generations; and
> (b) safeguarding the life-supporting capacity of air, water, soil, and ecosystems; and
> (c) avoiding, remedying, or mitigating any adverse effects of activities on the environment (Resource Management Act 1991, s5(2)).

Subsections (a) to (c) act as constraints on the management of the use, development and protection of resources (Memon & Gleeson, 1995). Matters of national importance that must be considered to achieve the purpose of the RMA are also specified.

An important result of the passage of the 1991 RMA at that time was to establish a common purpose for the management of natural and physical resources within the scope of a single statute, and require that a standardised resource consent process be followed if the RMA would otherwise be contravened due to a human activity (Nolan, 2005). In order to satisfy s5(2)(c) to avoid, remedy or mitigate any adverse effects, the resource consent process requires applicants to prepare an assessment of environmental effects. Such a requirement is considered to be consistent with an effects-based emphasis, and invariably has led to greater information needs of environmental effects, higher standards of treatments and compliance costs (Easton, 1998; Hughes, 2000).

A distinguishing feature of the RMA was the devolution of governance over the use of resources to regional or local bodies. The notion is that those parties who are best

informed should be given the authority to govern the use of resources (S. Kerr et al., 1998). Consequently, resource consent processes are managed at a local level (with the exception of some post-2005 projects of national significance). The pioneering New Zealand adoption of collaborative, devolved decision-making, or 'new environmental governance' was later followed by other jurisdictions in Europe, the USA and Australia (Gunningham, 2009; Wood et al., 2010).

2.3 Criticisms of the RMA

The RMA, its implementation, and more specifically, the resource consent process have provoked substantial criticism. Yet, notwithstanding the dearth of empirical research on the business impact of the RMA, there is considerable discussion of the perceived problems amongst commentators and government representatives. Many of the criticisms relate to its approach, the devolvement of decision-making and the interpretation of the legislation.

Some commentators argue that the urban planning/controlling approach of the RMA results in inefficiencies, encourages inappropriate use of resources and stifles innovation (R. Kerr, 2003; Robertson, 1996; Upton, 1998). In a study to investigate regulatory reform, Wilkinson (2001) offers anecdotal evidence of reductions in business investment, constraints on farming operations and delays in roading projects, which he attributes to the broad, central planning approach of the RMA. Research on infrastructure provision in the New Zealand infrastructure industries is suggestive of stagnating improvements in capital productivity from the early 1990s to 2001 (Clough, 2005). Clough (2005) suggests that protracted RMA processes may be in part to blame for lacklustre investment in energy infrastructure.

But the devolvement of substantial RMA administrative and implementation responsibilities to councils has led to criticisms of inappropriate decision-making. Upton (1997a; 1997b) contends that councils wrongly assumed responsibility for the s7(b) assessment of the efficient use of resources and implemented rules that go well beyond the RMA and environmental protection. Councils have also been accused of being excessively risk averse in setting policies and considering resource consents, with a consequence of hampering innovation and development (Upton, 1997a). McShane (2002; 2008) criticises the administration of the RMA by planners who he says seek to direct and control environmental activities rather than their effects.

Although councils were delegated substantial RMA decision-making powers, it is argued that resources for the implementation were deficient. Critics contend that regional and territorial authorities lacked the policy guidance (OECD, 1996, 2007), funding (Milligan, 1992) and expertise (R. Kerr, 2003) needed to efficiently administer the RMA and the resource consent process, resulting in ad hoc decision-making and costly processes (Upton, 1997b). The findings from case study research of 73 New Zealand businesses by Ernst & Young (1997) are arguably consistent with this contention. The firms interviewed covered a range of sizes, industries and geographical locations. Businesses perceived a need for clearer national standards and administrative guidance, and more information on local government objectives and processes (Ernst & Young, 1997). The Ministerial Panel on Compliance Costs (2001) consulted widely with New Zealand businesses in order to identify compliance cost issues and offer solutions to reduce the burden. They note that excessive delays at the Environment Court have also been a major source of increased business costs.

Delegation of environmental planning and management to councils was considered a useful means of enabling broad participation, social equity and better decision-making. But perceptions that pre-RMA environmental statutes unnecessarily constrained development, failed to adequately protect the environment and gave insufficient recognition to Maori perspectives, reflected diverse values that would inevitably be difficult to reconcile (Milligan, 1992). While the RMA attempted to address these issues in part through a consultative process of public participation, the breadth of consultation and lack of restraints on who may be heard increased the time and cost of processes (Milligan, 1992; OECD, 2007). Anecdotal evidence of trade competitors and objectors with frivolous claims (Ernst & Young, 1997; Ministerial Panel on Business Compliance Costs, 2001) appear to support Kerr's (2003) contention that nuisance objectors have delayed resource consent processes. Insufficient information and guidance have been blamed for difficulties in meeting the RMA's consultation obligations with respect to Maori (Ministerial Panel on Business Compliance Costs, 2001). Indeed, the challenges of achieving more effective participation in connection with new environmental governance have led to considerable international interest in this issue (e.g. Holley, 2010; Richardson, 1998; Simila Sr, Inkinen, & Tritter, 2008).

There has been frequent criticism of the ambiguity and/or appropriateness of some of the important terminology in the RMA (R. Kerr, 2003; Pardy, 1997; Upton, 1998). For example, Pardy (1997) criticises the vagueness of the RMA's aim of 'sustainable

management' and warns that different outcomes can result from the same set of facts when rules are subject to different interpretations. Research by Ernst & Young (1997) finds that firms frequently perceived inconsistencies between consent authorities in terms of implementation and enforcement of the RMA. This view is also supported in a 2001 report by the Ministerial Panel on Business Compliance Costs. They report that businesses perceived excessive variation in interpretation of the RMA and plans between and within councils.

Many of the above problems have been blamed as the cause of onerous compliance costs to businesses, particularly with respect to obtaining resource consents. The direct costs of obtaining resource consents include costs to employ consultants to prepare assessments of environmental effects, council application fees, yearly user charges and costs of consultation with interested parties. Appeals resulting from resource consent applications incur further direct, contingent and indirect costs (Sheppard, 1998). Direct costs of appeal include lawyers' and expert witness fees; contingent costs may arise if the court assesses fines and penalties to applicants and/or awards costs to be paid to other parties; and indirect costs include loss of revenues, poor utilisation of labour and expensive equipment, and changes to project and investment plans.

There have been very few studies to measure compliance costs. In 1997, Ernst & Young (1997) surveyed 73 New Zealand businesses that had recently applied for resource consent approval under the RMA. Few of the 73 businesses surveyed were able to estimate RMA-related environmental costs. Environmental compliance costs as a percentage of total business costs were less than 1% for half of 28 businesses, and less than 5% for the other half. Compliance costs amounted to less than 5% of total project costs for the majority of businesses. A report to the Ministerial Panel on Business Compliance Costs on a 2002 qualitative survey of 500 firms on the impact of business compliance indicates that on average, resource management legislation ranked as firms' third highest concern relative to other regulation (Massey, 2003). Fewer than 40% of respondents surveyed believed that the benefits of gaining resource consents either exceeded or equalled the costs. A more recent survey reports that from 2006 to 2008 environmental compliance costs as a percentage of total compliance costs rose from 13.6% to 15.1% over the entire sample, but declined from 13.7% to 12.0% for the largest firms with greater than 100 employees (Business New Zealand & KPMG, 2008). This same survey indicates that over this same period, environmental compliance costs as a percent of sales rose from 0.2% to 0.3% for the largest firms.

Several legislative attempts have been made to address many of the above criticisms of the RMA. These are discussed in the next section.

2.4 RMA Amendments

Efforts to improve the original RMA legislation are reflected in the list of the RMA amendment acts presented in Appendix 1. Many of the acts have included technical changes to tidy up inappropriate wording. Amendments such as the Resource Management (Aquaculture Moratorium) Amendment Act 2002, Resource Management (Waitaki Catchment) Amendment Act 2004 and Resource Management (Foreshore and Seabed) Amendment Act 2004 have been profoundly important to a minority of listed companies, but had less impact upon the majority. The most significant and wide-reaching amendments to the RMA reflect less of a strategic change to the purpose and principles and more of a change as to how they are operationalised with respect to resourcing and coordinating the implementation, the consultation processes and interpretation of the legislation. The first wide-reaching reform of the RMA, the Resource Management Amendment Act 2003, sought to reduce costs and delays, improve central government policy tools, broaden the list of matters of national importance, and remedy problems of implementation (Jamieson, 2003). However, the changes did not go far enough to satisfy some critics. Rob Fisher (2003) of the New Zealand Business Roundtable contends that the reforms did nothing to reduce compliance costs, uncertainty of business decision-making and local authority inconsistencies. Hence in 2005 another major RMA reform sought to address problems of lack of national leadership, inconsistencies, uncertainties and excessive delays and costs (Ministry for the Environment, 2005e). Subsequently in 2009, the Resource Management (Simplifying and Streamlining) Amendment Act was passed in a further effort to improve the efficiency and effectiveness of resource management processes and infrastructure development (Smith, 2009).

Several of the amendments sought to improve the implementation of the RMA which was reportedly undermined by inadequate policy guidance, insufficient coordination, and a lack of regional and local government expertise. The 1993 and 1997 amendments were arguably the first attempts to tackle the problems of inadequate policy guidance and coordination by clarifying processes and procedures with respect to resource consent applications (Phillipson, 1994). Further changes to consent

procedures were implemented in the 2003 and 2009 amendments to reduce delays and cut down on processing costs (Jamieson, 2003; Ministry for the Environment, 2009a). A new 'permitted baseline' test was introduced in 2003 to help councils and courts assess the effects of activities in resource consent applications (Bradley, Hassan, & Prebble, 2003). Policy guidance was given a further boost by the 2005 amendment through clarification of council and consent authority functions and powers (Nolan & Somerville, 2003). Further process and record-keeping requirements were imposed for resource consent pre-hearings and hearings, while new rules were added to streamline planning processes (Ministry for the Environment, 2005a, 2005b). To address criticisms that regional and local decision-makers lacked the experience and expertise to efficiently and effectively implement the RMA, the 2005 amendment also added accreditation and training programmes for resource consent hearing panel members and RMA practitioners (Ministry for the Environment, 2005a).

While the RMA has allowed for wide public participation in environmental decision-making, it has been argued that changes were required to prevent costly and time consuming delays. Problems of nuisance objectors (Ernst & Young, 1997) and a lack of clear guidelines for consultation with Maori (Ministerial Panel on Business Compliance Costs, 2001) were highlighted. Early attempts to expedite the consultation process began with a 1997 amendment that sought to more effectively disallow trade competition as a factor for authorities to consider in resource consent applications (Cutler, 1999). Fisher (2003) argues that this change was ineffective, as trade competitors were still able to engage in anti-competitive behaviour by putting forward alternative objections to delay proceedings. In 2003, further amendments limited some aspects of participation but widened others. A new category of 'limited notification' was introduced for some resource consents that had previously required public notification (Jamieson, 2003). But the scope for public representation at Environment Court proceedings was widened and more structured systems for iwi (tribal) input into regional and territorial plans were introduced (Jamieson, 2003; Nolan & Somerville, 2003). Both the 2005 and 2009 amendments streamlined the resource consent consultation processes further. Consent authority powers, processes and obligations for resource consent consultations were clarified, and authorities were given more power to strike out frivolous, vexatious or anti-competitive submissions (Hassan & Dick, 2005; Ministry for the Environment, 2009c).

Attempts to improve the ability of resource management decision-makers to correctly interpret the law are reflected in later RMA amendments that allow for increased central

government leadership and intervention. Decision-making by councils/consent authorities has been criticised as inconsistent (Ernst & Young, 1997), overstepping of their authority (Upton, 1997a, 1997b) and excessively risk averse (Upton, 1997a). The 2005 amendments sought to address interpretation problems through increased centralisation of control and better definition of consent authority powers and the conditions for exercising those powers (Ministry for the Environment, 2005a). As part of these changes councils were given new responsibilities relating to contaminated land, allocation of national resources and integration of infrastructure with land (Ministry for the Environment, 2005a, 2005b, 2005d). The 2003, 2005 and 2009 amendments revised, clarified and extended the scope of national environmental standard and policy statement provisions in order to allow for more central government guidance (Ministry for the Environment, 2009b; Nolan & Somerville, 2003). Compliance rules were also strengthened to clarify the relationships between national environmental standards, regional policy statements and council plans (Ministry for the Environment, 2005c). Both the 2005 and 2009 amendments increased the central government's ability to influence local authority policy statements/plans and to undertake monitoring and corrective actions with respect to the latter's performance. When resource consent applications and council plans reflect matters of national significance, central government intervention is possible, most recently through the 2009 establishment of an Environmental Protection Authority. These actions were in response to criticisms that critical development projects of national importance, such as energy generation, failed to proceed as a consequence of insufficient national policy guidance to councils on how to balance national and local interests (Daya-Winterbotham, 2004; Fisher, 2003; Hassan & Dick, 2005).

Enacting and implementing ground-breaking resource management legislation was arguably an ambitious endeavour for a relatively small, western country such as New Zealand. Achieving the 'right' balance between environmental protection and economic concerns involves making tradeoffs that legislators have found difficult to reconcile. In that context, the controversy generated by the RMA and the subsequent numerous legislative amendments is perhaps not surprising. Nevertheless, the above observations suggest that the process of obtaining resource consents to undertake major capital expenditure projects has imposed high costs and uncertainties on New Zealand businesses. The stated purpose of several of the RMA amendments (most recently, 2009) was to reduce RMA compliance costs, but there is little hard evidence to-date as to what extent this has been achieved. Furthermore, the actual benefits and costs to businesses of undertaking new projects that require resource consent are not

directly observable. Nevertheless, it is possible to observe and test stock market reactions to new project and resource consent disclosures, and these may provide economic insights. The next section considers why and how listed companies disclose information to investors about project-related resource consent progress and processes.

2.5 The disclosure environment for resource consent information

Finance literature suggests that corporate disclosures may have firm-specific as well as market-wide benefits (Leuz & Wysocki, 2008). Public news-releases may reduce investors' costs of information acquisition and improve risk sharing among them through increased homogeneity of beliefs and reduced speculative position-taking (Diamond, 1985). More informative disclosure practices may attract more potential investors, enhance the accuracy of investors' predictions, reduce asymmetry in performance expectations and in turn, reduce firms' costs of capital (M. H. Lang & Lundholm, 1996). In their review article of empirical corporate disclosure literature, Healy and Palepu (2001) argue that efficient functioning of capital markets is enhanced by corporate disclosures. They contend that the independence of the statutory bodies, auditors and intermediaries adds credibility to disclosures, thereby reducing information asymmetry and agency costs. In New Zealand, project-specific resource consent information tends to be disclosed by companies through annual financial reports, environmental reports, stock exchange announcements or media reports.

There are no statutory requirements under the Resource Management Act for the specific accountability reporting of resource consents, but until 2007 general reporting standards applied under promulgations from the Institute of Chartered Accountants of New Zealand (Tozer & Hawkes, 2001). Resource consent costs are inseparable from a particular project, so for accounting purposes they form part of the project assets, such as property, plant & equipment, investment property, mineral resource exploration assets or intangible assets. S7.9 of The Statement of Concepts for General Purposed Financial Reporting required any assets (such as property, plant and equipment and investment property) to be capitalised in the balance sheet when their costs were reliably measurable and if future economic benefits were probable (Institute of Chartered Accountants of New Zealand, 2001). Otherwise, resource consent costs had to be expensed. These requirements remained materially unchanged as a

consequence of the staggered 2005 to 2007 New Zealand adoption of International Financial Reporting Standards (IFRS). Initial recognition of resource consent-related assets is normally at cost, and then after the asset is in use, companies generally have the choice of measuring the asset at cost or fair value, as long as they are consistent within each asset class. The notable exception to this is for property investment assets held for capital growth or rental income, which were valued at market value net of estimated disposal costs pre-IFRS and at fair value post-IFRS. Revaluations must be regular enough to ensure that there is no material deviation from fair value, or annually in the case of property investments. In summary, resource consent costs are either expensed if they fail to meet the asset test, or capitalised as part of the asset to which they relate. The subsequent revaluation of assets would tend to sever the direct link between the actual resource consent expenditures and the reported balance sheet value of the asset. In any event, resource consent outlays are not required to be separately identifiable to readers of financial statements.

Survey findings from 44 New Zealand listed company Chief Financial Officers reveal that only one out of a total of 24 respondent companies that held resource consents reported them separately in the financial statements (Tozer & Hawkes, 2001). In the same study, a document search of listed company annual reports from 1996 to 1998 confirms that the majority of companies failed to specifically identify resource consent expenditures as assets. The reasons for non-disclosure included valuation problems (such as not being separately identifiable) and lack of material cost. These findings imply that most respondents either expensed the resource consent costs, or reported the assets to which they relate at fair market value.

There may well be other impediments to the disclosure of resource consent information through annual financial reports. Financial statement information may lack timeliness or may reveal excessive proprietary information. Gelb (2000) finds evidence that for firms in industries with low entry barriers, signalling may be less costly using dividends and stock repurchases than by making accounting disclosures that could potentially reveal useful proprietary information to competitors. Joshi, Krishnan and Lave (2001) study the method of accounting for environmental compliance costs by 55 US steel mills from 1979-1988. They show that for every $1 in direct compliance costs separately identified in the accounting system, another $9-$10 of indirect environmental costs are embedded in other accounts. They caution that the underestimation of environmental costs may lead to non-optimal investment and plant closure decisions. Voluntary firm communications through environmental reports are alternative means of disclosing

resource consent information. However, environmental reports are unlikely to provide any more timely information than annual reports and moreover, they are not commonly produced by New Zealand listed companies.

For most investors, the only timely, widely available resource consent information is transmitted via the stock exchange and media. With legislative backing through amendments to the Securities Market Act 1988, effective from 1 December 2002 immediate disclosure to the New Zealand Exchange (NZX) is required under their continuous disclosure regulations if information materially affects the value of a listed company's securities (New Zealand Exchange, 2005). Previously, under the stock exchange Listing Rule 10.1.1, relevant (i.e. price-sensitive) information possessed by a listed company was required to be immediately disclosed to the market when the value of confidentiality no longer exceeded the value of disclosure (McLaughlin & Wallis, 2002). This implies that resource consent announcements to the stock exchange may provide economic insights. A search of the NZX announcements database i-Search from the date of the implementation of the Resource Management Act in 1991 to August 2007 revealed 287 resource consent announcements by 33 NZX-listed companies pertaining to 111 different projects or proposals. These and other resource consent disclosures are also frequently reported upon by the media. For example, a search of a leading business newspaper, The New Zealand Herald for the 2005 year finds the term "resource consent" in 421 different articles, but the type and nature of information discussed varies considerably.

Announcements of resource consent news may provide investors with useful and timely information that is incremental to information available through other sources. Resource consent approval is generally needed before important new projects can proceed, such as the establishment and development of a new landfill site, a wind farm or retirement village. Each new project may require the applicant to request several resource consents if different types of uses are planned (such as land use, water, discharge, coastal or subdivision) or if more than one RMA authority has jurisdiction over the affected geographical locations. Upon the initiation of a project a company may announce their project and resource consent plans, and then later as the resource consent process ensues they may report further details of delays, progress, appeals and/or approvals. Nevertheless, the information communicated through the stock exchange and media tends to be largely non-financial. Information is not routinely disclosed about the types of consent sought, the dollar value of expected compliance costs, expected time horizon, project investment cost or conditions imposed. Given the

lack of detailed quantitative information available to investors, the usefulness of company-generated resource consent announcements in assisting investors to assess the project cash flow and risk consequences appears uncertain. While the net economic impact to businesses of the resource consent process is not directly observable, capital market reactions to company announcements about their new capital expenditures and resource consent progress can be measured. This implies that these listed company announcements provide an opportunity to empirically test the market valuation implications of resource consent information. Accordingly, this is the focus for this study.

2.6 Conclusion

In this chapter the RMA and criticisms related to its approach, the devolvement of decision-making and its interpretation have been discussed. The media and anecdotal evidence suggest that the process of obtaining resource consent approval to undertake major capital expenditure projects has imposed excessively high compliance costs and uncertainties on New Zealand firms. Announcements of new capital expenditures and resource consent progress are suggested to contain news that is potentially useful to investors in valuing listed companies. To further inform this study, the next chapter will consider previous research regarding the economic consequences of environmental regulations, the shareholder wealth implications of capital expenditures and the short-horizon capital market impact of firm-specific announcements.

Chapter 3: Literature review

3.1 Introduction

In this literature review, theoretical and empirical evidence is presented to inform an analysis of the capital market impact of resource consent information. This chapter will synthesise and discuss previous economic regulation, capital investment and capital markets research that is most relevant to this thesis.

The review commences by discussing the theoretical and empirical evidence pertaining to the first thesis research aim, being to examine the impact of environmental regulatory delay on capital market reactions to capital expenditure announcements. A brief introduction presents alternate views of environmental regulation as a source of net costs or net benefits to firms. Then, some of the theoretical and empirical evidence supporting the contrasting views are presented. Next, a synthesis of selected literature considers some of the factors that have been identified as important in explaining the shareholder wealth impact of capital expenditure decisions.

The following section then reviews the theoretical and empirical literature relating to the second research aim, being to investigate the capital market impact of resource consent announcements. A synthesis of the literature discusses selected research on stock price, volatility and trading volume reactions to firm-specific announcements and factors that influence them. The literature on the information content of firm-specific environmental disclosures is then reviewed, complementing the previous discussion of the environmental regulation research.

The concluding section briefly summarises the literature review and its implications relative to the research aims of this thesis. Attention is drawn to gaps in the research which this thesis seeks to fill, thereby setting the foundation for the development of the hypotheses proposed in the next chapter.

3.2 Theory and evidence of the economic effects of environmental regulation

As demonstrated in Chapter 2, the RMA and the process to obtain resource consent approval have generated considerable controversy, with criticisms being raised of excessive compliance costs and uncertainties for businesses. The criticisms are consistent with the neoclassical economic view that environmental regulations impose a net cost upon businesses. According to this view, environmental capital expenditures are likely to result in either negative returns to firms, or at least returns that are substantially lower than are possible from other investments (e.g. Palmer et al., 1995; Walley & Whitehead, 1994). A contrasting view argued by Porter & van der Linde (1995) is that firms may be able to gain net economic benefits through environmental initiatives. They present case studies to support their view that well-designed environmental regulations can encourage resource productivity, enhance innovation and improve competitiveness. According to what is now referred to as the 'Porter hypothesis', environmental regulation that promotes waste prevention, encourages continuous improvements, and sets realistic compliance deadlines can foster industry innovation that can yield early mover advantages. Proponents of this view see potential economic benefits to be gained by firms that undertake environmentally-related product differentiation, thwart competitors by raising environmental standards, implement cost-reducing or innovative technologies and improve their environmental risk management systems (Reinhardt, 1999). To consider the theoretical and empirical evidence for and against these views as they relate to this thesis, empirical evidence of the capital market reaction to the passage of environmental legislation is presented first. Then theoretical and empirical literature is discussed that relates economies of scale, the allocation of property rights, environmental performance, and technology innovation/investment to the economic impact of environmental regulation.

3.2.1 Environmental regulatory events

Some studies have used event study methodology to examine the stock market reaction to environmental legislative news announcements. Shane (1995) finds important events surrounding the enactment of the 1969 National Environmental Policy Act and the 1970 Clean Air Act Amendments are associated with a 12% decline in shareholder equity. Blacconiere and Northcut (1997) find that 17 announcements of environmental legislative actions from 1985 to 1986 result in negative abnormal returns

over a sample of 72 US chemical stocks. In contrast, Diltz (2002) reports mixed stock market reactions to events in connection with the imposition of more stringent emissions standards under the Clean Air Act Amendments of 1990. Diltz (2002) suggests that uncertainties regarding the legislation rather than increasing compliance costs are driving the abnormal returns. Together, these findings imply that environmental regulations are not perceived by investors to be economically beneficial to firms and as suggested by the neoclassical economics view, in some cases the economic costs exceed the benefits to firms.

3.2.2 Economies of scale

Other research has considered how firm-level economies of scale may be affected by environmental regulation. If economies of scale or other advantages relating to compliance with environmental regulations exist such that optimal firm sizes are larger, then over time, smaller firms will either grow or exit the industry, and larger firms will increase their market share and market power. Kohn (1988) derives a general equilibrium theoretical model that shows that pollution abatement costs favour larger firms and induce higher industry concentration. Studying plants within the manufacturing industry from 1972 to 1977, Pashigian (1984) finds evidence that environmental compliance costs decreased the number of plants and labour intensity, and increased the average plant size. He concludes that environmental regulations increase production costs and prices, lower output and cause small (large) plants to lose (gain) market share. Bartel and Thomas (1985) study the impact of OSHA and EPA compliance costs on the profitability of manufacturing firms from 1974 to 1978. Their measure of compliance costs is proxied by the value of safety violation penalties imposed. They argue that while the direct effects of health, safety and environmental regulations may well bring costs, further indirect effects may result in competitive advantages to incumbent firms that outweigh the direct costs. Compliance and enforcement asymmetries, where one firm suffers more regulatory burden than another, may result from regulatory compliance economies of scale and differential enforcement of standards. Their empirical results indicate that larger and older firms profited to the detriment of smaller and newer firms. Similarly, Helland and Matsuno (2003) find that the largest firms (in the top 25% size quartile) in their study gained significant increases in Tobin's q as a result of increases in environmental compliance capital expenditures. The authors conclude that large firms within an industry are relatively advantaged by earning monopoly rents from the imposition of more stringent

environmental regulations that increase barriers to entry. Dean, Brown and Stango (2000) find that small firm formations are negatively related to pollution abatement operating cost intensity, suggesting high barriers to entry.

The weight of evidence suggests that large firms may benefit at the expense of smaller firms from higher per unit environmental compliance costs and increased barriers to entry. In the New Zealand context, this implies that the compliance costs incurred by firms to gain resource consent approval with respect to new projects may be relatively higher for small firms, and may differentially advantage large firms.

3.2.3 The allocation of property rights

New Zealand resource consents give an applicant a property right to use a common resource. With the exception of some water permits, this property right is only transferable as part of the asset to which it relates (i.e. together with manufacturing plant, land, etc). Some research considers the wealth implications of similar property rights. Buchanan and Tullock (1975) develop a theory of policy choice between penalty taxes and direct regulation via quotas. The authors contend that regulations that restrict industry outputs by enforcing environmental efficiency standards have the effect of creating barriers to new industry entrants. The result is that industry participants earn economic profits. From their analysis, the authors conclude that producers would prefer the imposition of enforceable quotas over environmental penalty taxes. Similarly, Counsell and Evans (2005) criticise the first-in, first-served approach for the New Zealand allocation of water rights through resource consents as inefficient, noting that, notwithstanding the legal tradability of water rights under the RMA, in practice barriers to trade persist. Furthermore, when environmental regulations assign property rights to environmental assets in order to solve a scarce-resource problem as in the case of licenses and permits, the wealth of regulated firms may increase (Maloney & McCormick, 1982; Schwert, 1981). The intuition is that regulation-imposed input restrictions cause average costs to increase. Consequently outputs fall, prices rise and profits increase. This is exacerbated if barriers are imposed to new industry entrants. Maloney and McCormick (1982) find that the imposition of clean-air laws in 1970 introduced a barrier to the construction of new metal smelting plants that economically benefited incumbent producers.

In some cases, permits or rights may encourage existing firms to engage in strategic behaviour. Mason and Polasky (1994) consider a common property resource model where sunk costs of entry, such as licensing/permitting and capital costs, are positive. The model suggests that to deter new industry entrants, incumbent firms have incentives to deplete the common property resource, which raises future costs of extraction and discourages new entrants. In tradable pollution permit markets, Misiolek and Elder (1989) describe how permit-holders may engage in exclusionary manipulation by banking permits to drive up rival's costs.

Resource consents restrict the use of common resources (i.e. air, land and water). For example, there is a limit to the number of wind farms that can occupy a mountain range, hydro-generation projects that can use a specific water resource, or retirement villages that can enjoy a particularly strategic location. The literature discussed above implies that such restrictions may benefit some industry incumbents. Furthermore, the time and costs to obtain resource consent approval for a new project may impose a barrier to new industry entrants and confer an economic benefit on existing resource consent holders.

3.2.4 Environmental performance

An alternative body of literature has developed from the 'resource-based' view of the firm which holds that valuable internally-developed capabilities and resources within the firm may provide sustainable competitive advantages. For example, through an early-mover strategy, a firm may set higher standards or access scarce resources (such as a good location, raw materials or productive capabilities). Similarly, a firm may develop expertise through experience and practice. Using a framework of pollution prevention, product stewardship and sustainability strategies, Hart (1995) develops a 'natural-resource-based view of the firm' as a source of competitive advantage that he argues can lower costs, pre-empt competitors and sustain the firm's future position. For example, the adoption of environmental management systems (EMS) is perceived by North American managers surveyed by Melnyk, Sroufe and Calantone (2003) to bring improvements in operational performance. However, studies examining the profitability associated with environmental performance have found mixed results. Russo and Fouts (1997) find that return on assets is positively related to environmental performance rating, particularly for firms in industries experiencing high sales growth. They argue that in high-growth industries, reputational advantages and industry-wide

political strategies are more important. Yet in the pulp and paper industry, Jaggi and Freedman (1992) provide evidence of a negative relationship between pollution performance and accounting profit measures. Studies using Tobin's q as a measure of firm value have found it to be negatively related to toxic chemical disclosures (Konar & Cohen, 2001), positively related to the use of a single, rigorous environmental standard across all jurisdictions for multinational firms (Dowell, Hart, & Yeung, 2000), and positively related to waste prevention practices (King & Lenox, 2002). However, no significant impact on Tobin's q is found for other pollution reduction and waste management efforts (King & Lenox, 2001, 2002).

The above findings are not definitive that it 'pays to be green'. One could conjecture that the process of gaining resource consent approval may give a firm an early mover advantage, provide reputational benefits or induce improvements in a firm's EMS that reduce waste and risks of exposure to environmental liabilities. In such a case, there may be net benefits to firms that initiate the resource consent process. Alternatively, the net benefits may not be sufficient to overcome any direct and indirect compliance costs.

3.2.5 Technology innovation and investment

Further research has been driven by the Porter hypothesis which proposes that proactive firms may benefit from environmental regulation through technological innovation and investment. The literature most directly related to this thesis has considered how investment activities may create barriers to new firm entry, affect firm productivity, and influence firm profitability, equity values, and shareholder wealth.

A body of literature has investigated how sunk costs may affect competitive conditions within an industry by imposing barriers to new firm entry. Rivoli and Salorio (1996) suggest that sunk costs caused by the irreversibility of an investment (as in the case of specialised equipment) decrease the likelihood of current investment and enhance the value of delaying investment. The prospect of incurring large losses due to irreversibility may also inhibit exit and deter new entrants. Using a dynamic model of oligopoly, Ryan (2005) studies the impact on the US Portland cement industry of new requirements for operational permits, monitoring, reporting and emissions under the US 1990 Amendments to the Clean Air Act. He finds the sunk costs of entry to the industry increased with a consequence of greater market concentration and concludes that

incumbent firms gained market power due to a decrease in competition. The findings of two empirical studies are consistent with these theories. Dean and Brown (1995) use a regression equation to model the logarithm of new firm entrants in each of 306 manufacturing industries from 1976 to 1980 against industry pollution abatement capital expenditure intensity and control variables. The authors find a significantly negative impact of abatement capital expenditure intensity on new firm entry, thereby conferring a relative advantage on incumbent firms. Such an outcome would have anti-competitive implications. While the Dean and Brown (1995) study produces modest evidence of barriers to new entrants, this does not necessarily infer that existing firms can earn economic rents. If product demand is elastic, then firms may be unable to incorporate environmental compliance costs into selling prices. Alternatively, the apparent barriers to entry may be transitory. In a similar spirit, Dean, Brown and Stango (2000) find that during the period 1977 to 1987, both small and large firm formations in the manufacturing industry were negatively related to industry sunk costs (irreversible capital investments). However, only small firm formations were significantly negatively affected by pollution abatement operating cost intensity. This suggests that capital expenditures may impose entry barriers that are independent of new entrants' size, while environmental compliance operating costs may deter small firm formation.

The Porter hypothesis suggests that environmental initiatives may increase firm productivity, and accordingly some research has considered the relationship between environmental capital expenditures and productivity. Barbera and McConnell (1986) provide empirical evidence that pollution abatement capital expenditures reduced the productivity growth for labour and capital in three of four US pollution-sensitive industries from 1960 to 1980. Similarly, Boyd and McClelland (1999) consider the potential for 'win-win' situations for paper manufacturers to reduce costs and pollution without reducing productive output. The extent to which labour, material or capital investment resources are diverted to pollution control is considered an environmental constraint. They find that inputs and pollution may be reduced by 2% to 8% without affecting output. However, they find environmental constraints reduce productivity by 9%, in part due to pollution abatement capital expenditures that reduce firms' abilities to undertake other capital investments. Shadbegian and Gray (2005) consider the consequences of abatement capital expenditures on plant-level productivity in the paper, oil and steel industries from 1979 to 1990 but only in the paper industry do they find evidence of increased productivity. They find the use of 'dirty' versus 'clean' production technologies has little effect on productivity. The authors conclude their findings are not consistent with the Porter hypothesis that more stringent environmental

regulation induces increased productivity which offsets any direct abatement costs. From their review of the conflicting evidence on the impact of environmental regulations on firm productivity, Batabyal and Nijkamp (2008) conclude that while direct effects tend to be negative, indirect benefits (such as improved productivity) may result from firms' actions to improve their capital stock.

How environmental capital expenditures affect profitability, firm value and shareholder wealth is of particular relevance to this thesis. Motivated by the first-mover advantage and sustainability literature, Nehrt (1996) investigates the effect of environmental capital investment timing and intensity on pulp and paper firm profit growth from the mid-1980s to early 1990s in eight countries. The author suggests that early adopters may benefit from learning effects or timing issues. Learning through experience with new technologies may reduce unit costs to early adopters and provide a competitive advantage. Time to gain operating permits and procure, install and operationalise new equipment may be so lengthy that laggards may not be able to catch up with early adopters. The findings indicate that early adopters enjoy greater profit growth than laggards, but investment intensity and type of environmental regulations have no differential impact. This suggests that the factors influencing profit growth may be more closely related to internally-developed company strategies than to the prevailing type of external regulations. Helland and Matsuno (2003) test a fixed effects regression equation of changes in Tobin's q as a proxy for increases in economic rents against environmental capital expenditures, firm size and other control variables for 1,100 firms over the years 1983 to 1994. They find a strongly positive relationship between increases in environmental capital expenditures for large firms and increases in Tobin's q, and conclude that environmental regulations impose barriers to entry that allow large firms to earn monopoly rents. Using a regression equation based upon the Ohlson (1995) valuation model, Clarkson, Li and Richardson (2004) investigate the equity valuation implications of environmental capital expenditures in the pulp and paper industry. They find that market value of equity is positively related to environmental capital expenditures for low-polluting firms and negatively related to a measure of toxic emissions. The authors suggest that low-polluting firms invest heavily in environmental capital expenditures and benefit economically from such investment through improved operating efficiencies and increased rivals' costs. In contrast, Johnston (2005) suggests that regulatory compulsion may differentiate the economic effects of environmental capital expenditures. Regulatory environmental capital outlays that are necessitated by environmental legislation are hypothesised to be negative NPV projects. In contrast, voluntary environmental capital expenditures (VCAP) are

proposed to be driven by corporate strategy and may lead to innovations that reduce waste or prevent future environmental compliance costs. Using pooled cross-sectional regression estimates, Johnston (2005) finds regulatory environmental capital expenditures to be negatively related to future abnormal earnings and market values, and VCAP to be positively related to future abnormal earnings. His findings imply that environmental capital expenditures that are driven by regulatory requirements are less likely to create economic value than those motivated by firm strategy.

The environmental technology innovation and investment literature described above suggests that sunk costs involving irreversible investments may deter new entrants and relatively advantage early adopters of new technology through decreased competition or increased market power. However, not all environmental capital expenditures may produce firm-level benefits. It appears that environmental capital outlays mandated by regulatory requirements may hamper firm productivity and reduce firm value. However, first movers, large firms, low polluters, and firms undertaking voluntary environmental capital expenditures may derive an economic advantage from their investment activities.

Some reviewers of the literature on the economic impacts of environmental regulation find the evidence to be less than definitive. Jaffe, Peterson, Portney and Stavins (1995) suggest that there is insufficient evidence to conclude that environmental regulation either hampers or improves productivity, innovation or competitiveness. They point out that most studies failed to control for costs of delays and litigation caused by environmental regulation. From their review of literature on the impact of environmental regulations on firm productivity, Batabyal and Nijkamp (2008) fail to find conclusive support for or rejection of the Porter hypothesis. However, reviewing the literature on the competitive implications of environmental regulation, Heyes (2009) concludes that environmental regulations may induce large irreversible investment costs, incumbent firm advantages, and time delays that can discourage new industry entrants. Furthermore, early-movers may enjoy subsidies through free allocation of permits that may not be available to laggards.

3.2.6 Conclusion on the literature of the economic effects of environmental regulation

Notwithstanding the mixed evidence, the literature reviewed in Section 3.2 has important (but as yet untested) implications for New Zealand firms undertaking projects with resource consent requirements. The results of studies of environmental regulatory events imply that the RMA as a whole may well impose direct costs on New Zealand firms. Yet as noted by Helland and Matsuno (2003), environmental regulations may have the troubling consequences of decreasing market competition through redistribution of industry wealth and increases in industry concentrations. Resource consent compliance costs may induce economies of scale that erect barriers to entry resulting in reduced competition and economic advantages for large firms. Holding resource consents may allow a first-mover advantage to incumbent firms through the restrictions on use of a common resource and barriers to new entrants. However, the extent to which resource consent holders are able to benefit from the development of valuable internal capabilities is not clear from the rather mixed findings of the environmental performance literature. Implications from the technology innovation and environmental investment literature are that large firms, early adopters, and firms pursing voluntary capital initiatives may be advantaged by the resource consent rules relative to small firms, late adopters and firms undertaking regulatory mandated investment. This thesis fills a gap in the literature by considering some of these issues, including the costs of regulatory delays, as they relate to the resource consent process.

The projects to be investigated in this thesis are voluntary, not mandated, and they are not environmental capital expenditures. Rather, they are capital expenditures that must comply with environmental regulations and standards. Accordingly, the literature on the shareholder wealth implications of firm capital expenditures is reviewed next.

3.3 Theory and evidence of the shareholder wealth implications of capital expenditures

The investment opportunities theory suggests that managers are able to maximise the market value of the firm by undertaking positive NPV projects (Miller & Modigliani, 1961). Much of the empirical finance research seeks to test aspects of this theory by

considering the role of strategic advantages, investment opportunities, free cash flows and firm structure in explaining the economic impact of capital expenditure decisions.

3.3.1 Strategic sources of competitive advantage

One thread of literature suggests that strategic capital expenditures may be a source of competitive advantage to firms. Porter (1979) contends that firms can devise successful business strategies by considering competitive conditions and erecting barriers to entry. For example, by undertaking new, irreversible capital expenditures that require substantial financial resources, firms may create barriers to new entrants and thereby gain competitive advantages. Government regulation may also impose entry barriers by restricting access to common resources such as air and water. Firms' survival and growth can thus be positively influenced by their success in creating barriers to entry. Nevertheless, Porter (1979) argues that being an industry leader does not necessarily allow incumbents to benefit financially. For example, new technological advances may reduce capital and/or operating costs for new entrants who may gain cost advantages relative to industry incumbents. Alternatively, industry incumbents with large investments in specialised assets may experience exit barriers that incentivise them to reduce profitability in order to deter new competitors. Further theoretical literature has considered the circumstances that allow first movers to benefit from capital expenditures. Spence (1979) models an optimal investment strategy for firms to pre-empt rivals during the growth phase of an industry. Using a model to explain changes in the number of firms in the US tire industry from 1906 to 1971, Jovanovic and Macdonald (1994) find that first movers who invest in cost-reducing technology earn economic rents during the early stages of the industry life cycle when technological expertise has not as yet diffused to industry rivals. More recently, Bernardo and Chowdhry (2002) develop a continuous-time model whereby firms gain competitive advantage by undertaking capital investments that assist them to develop expertise that creates valuable real options.

Empirical tests using event study methodology have attempted to shed light on the ability of strategic capital expenditures to produce competitive advantages. One of the earliest studies by McConnell and Muscarella (1985) considers the excess returns arising upon the announcement of changes in planned capital expenditures by US industrial companies and public utilities from 1975 to 1981. Evidence that excess returns are positive for unexpected increases and negative for unexpected decreases

in the capital budget is considered consistent with the market value maximisation hypothesis. Using event study methodology with market-adjusted returns, Woolridge and Snow (1990) predict that stock market reactions to a variety of capital expenditure announcements will be positive under the shareholder wealth maximisation hypothesis if managers seek to maximise firm value. In contrast, under the institutional investors hypothesis, they predict the market will react negatively if investors prefer short-term profits. Finally, they expect market reactions to be neutral under the rational expectations hypothesis if competitive conditions limit opportunities to generate positive NPVs. Their sample is collected from the 'What's News' feature in the Wall Streeet Journal from 1972-1987. Woolridge and Snow (1990) find statistically significant day 0 abnormal returns of 0.31% (0.36% for two-day cumulative abnormal returns) for capital expenditure announcements. When all strategic investment types are considered, including joint ventures, R&D, capital expenditures and product/market diversification, they find that projects earn positive abnormal returns, irrespective of the expected investment horizon. The authors conclude that the evidence supports the shareholder value maximisation hypothesis, as investors do not take a myopic perspective by positively valuing only short-term investments. Yet, in a study of UK listed company new capital expenditure announcements from 1989 to 1991, Burton, Lonie and Power (1999) find insignificantly positive abnormal returns for both immediate and non-immediate cash-generating projects, and significantly positive abnormal returns for joint venture projects. They conclude that the market reaction to individual firm project announcements is consistent with a rational expectations explanation whereby the market anticipates the capital expenditure news of large, listed companies. Jones, Danbolt and Hirst (2004) consider the role of options in explaining market reactions to stock exchange investment announcements by UK listed firms. Projects involving R&D and product/market diversification are suggested to create future growth opportunities, while cost reduction and asset expenditure projects are assumed to exercise growth options. Over a three-day event window, announcements of projects that create growth options are found to be associated with significantly greater market-adjusted returns than announcements of projects that exercise growth options. Taken together, these three studies do not support a view that investors are myopic as suggested by the institutional investor hypothesis.

Chen, Ho and Shih (2007) study the intra-industry effects of US corporate capital expenditure announcements, and consistent with the competitive advantages suggested by Porter, they find a positive impact on announcers' event-period abnormal returns and a net negative effect on competitors' market values. Furthermore, rivals are

more adversely affected by competitors' first announcements of new capital expenditures than by followers' subsequent investment announcements. This suggests that competitive effects of the announcements dominate potential contagion effects and supports the notion of a first-mover advantage through the creation of barriers to entry. More recently, Chen and Su (2010) investigate the market impact of US corporate capital investment announcements and report that the response is more favourable when announcers are first-movers within an industry. Their sample period starts in January 1989, but they fail to describe how announcements prior to the sample period affect their subsequent categorisation of firms as first-movers or followers. Furthermore, the announcement period median cumulative abnormal returns for leading announcers (0.41%) are considerably lower than those for the mean (0.78%). This suggests that their sample data is non-normal, yet the authors fail to report non-parametric event study statistics such as the Corrado rank test. The difference in median cumulative abnormal returns between leaders and followers is weakly positively statistically significant at the 10% level. Nevertheless, the methodological problems in Chen and Su (2010) limit the reliance that can be placed on their results.

3.3.2 Investment opportunities and free cash flow

Several event studies have investigated the investment opportunities hypothesis by considering the relationship between Tobin's q and excess returns around capital investment announcements. Tobin's q (Tobin, 1969, 1978) is frequently used in finance and economics literature as a measure of growth opportunities (e.g. Gelb & Siegel, 2000; L. H. P. Lang, Ofek, & Stulz, 1996). For a value-maximising firm, capital investment opportunities should be pursued if the marginal $q > 1$. To the extent that announcements of increased spending have not been anticipated, capital market reactions to investment news should be favourable when $q > 1$ as reflected by positive abnormal returns. Conversely, when a firm's marginal q is negative, announcements of increases in capital expenditure should result in negative abnormal returns. Marginal q is not directly observable, so financial research uses firm average Q instead, assuming that $q = Q$. Presenting evidence of a significant relationship between average Q and cumulative excess returns for 1985 to 1989 US news of capital budget decreases, Blose and Shieh (1997) conclude that capital expenditure announcements were largely anticipated for increases in the capital budget, but not for decreases. However, Chung, Wright and Charoenwong (1998) find that announcements of increases in capital

expenditures from 1981 to 1995 by US firms with high (low) growth opportunities are associated with positive (negative) event-period abnormal returns.

Other studies have attempted to incorporate both investment opportunities and free cash flow (FCF) implications into their analyses of reactions to capital expenditure announcements, with mixed results. The FCF hypothesis suggests that the use of debt may reduce agency costs whereby managers may have incentives to misuse excess cash resources (Jensen, 1986). Vogt (1997) finds that for large firms that announce capital spending increases, excess returns are positively related to investment opportunities (Tobin's q) and negatively related to cash flow coverage. Although they find no statistically significant reaction to Spanish capital investment announcements from 1991 to 1997 on day 0, Del Brio, Perote and Pindado (2003) present some evidence of pre-event informed trading. Analyses of pre- and post-event abnormal returns indicate some support for the free cash flow theory for high-q firms announcing increases in capital expenditures. In an Australian study of capital expenditure announcements from 1995 to 1997, Brailsford and Yeoh (2004) find that the quality of growth opportunities, proxied by the market/book (MB) ratio, is paramount in explaining market reactions to capital expenditure announcements, and that cash flow alone has no explanatory power. However, for low MB ratio quartile firms with high cash flow, announcement period cumulative abnormal returns are negative. Chen and Ho (1997) and Chen (2006) also find that the presence of growth opportunities is important while the FCF variables are not useful in explaining the market reaction to corporate capital expenditure announcements. Both these studies find that the firms' debt ratio is positively associated with capital expenditure announcement period abnormal returns, suggesting that higher debt levels signal less opportunity for wasteful use of free cash flow.

The above results suggest that investment opportunities may be important in explaining capital market reactions to capital expenditure announcements. However, the relevance of free cash flow appears to be less certain.

3.3.3 Firm structure and size

Research investigating the role of firm structure in explaining market reactions to capital expenditure announcements has considered joint venture arrangements, focus and family ownership. Both Jones, Danbolt and Hirst (2004) and Burton, Lonie and

Power (1999) present evidence that capital expenditures are viewed more favourably by the markets when undertaken by joint venture arrangements rather than by individual companies. Chen (2006) considers the influence of focus and diversification in explaining the economic impact of corporate capital investments in the US from 1989 to 1999, and finds that announcements generate higher abnormal returns when firms are focused and have better investment opportunities. Studying Korean listed company capital expenditure announcements by chaebols (family-owned conglomerates) and non-chaebols from 1992 to 1999, Kim, Lyn, Park and Zychowicz (2005) find that abnormal returns are observed only for non-chaebol announcements, implying that agency costs of family-owned conglomerate corporate governance structures impact negatively on shareholder wealth maximisation. The above studies suggest that capital expenditures by joint ventures and firms with non-diversified structures may be more successful in creating positive economic value.

Firm size can be an important consideration when assessing the capital market impact of capital expenditures. The differential information hypothesis proposed by Atiase (1985) suggests that news of large firms is more likely to receive the attention of the media and security analysts than that of small firms. This steady flow of information concerning large firms is absorbed by market participants and impounded into stock prices, such that the degree of surprise of subsequent announcements is likely to be lessened for large firms. Empirical evidence of reactions to capital expenditure announcements is generally consistent with this hypothesis, finding a negative relationship between the market valuation of capital expenditure announcements and firm size (e.g. Chen, 2006; Chen & Ho, 1997; E. Jones et al., 2004).

3.3.4 Conclusion on the literature of the shareholder wealth implications of capital expenditures

The finance literature reviewed in Section 3.3 provides contrasting shareholder wealth implications for New Zealand listed companies that undertake capital expenditures with resource consent requirements. The above evidence suggests that a first mover strategy may allow firms to gain a competitive advantage. Alternatively, the costs may be so great that profitability of industry incumbents suffers. The literature further suggests that the presence of investment opportunities, the use of financial leverage (free cash flow), firm structure (joint venture arrangements) and firm size may influence capital market reactions to capital expenditure announcements. However, the empirical

capital expenditure literature has yet to explicitly consider the potential influence of environmental regulatory delay on the stock market reaction to capital expenditure announcements. This thesis fills this gap.

3.4 Theory and evidence of short-horizon capital market reactions to firm-specific announcements

Next, the theory and evidence of short-horizon capital market reactions to firm-specific announcements is reviewed in order to inform the hypothesis development for the second research aim of investigating the stock market impact of resource consent announcements. The efficient markets hypothesis provides the theoretical foundation for the study of capital market reactions to information and events. An efficient market is one in which "security prices at any time fully reflect all available information" (Fama, 1970, p. 383). Security market prices are important to firms and investors as they convey signals for the allocation of resources. In an efficient capital market, the market value of a firm's securities is equal to the present value of expected future cash flows. By considering how security prices change in response to a public release of information, the market valuation implications can be estimated. Furthermore, evidence of changes in valuation and risk can provide useful insights into the capital market impact of corporate policy decisions (Kothari & Warner, 2004) government regulations (Schwert, 1981) and financial reporting standards (Kothari, 2001).

3.4.1 Efficient markets and rational expectations

The theoretical underpinning for the development of the efficient markets hypothesis was proposed by Samuelson (1965) who argues that in an informationally efficient market wherein market prices properly reflect all investors' information and future expectations, it is not possible to forecast future price changes. Fama (1970) further develops the theory of efficient capital markets by bringing together the fair game, submartingale and random walk models together with empirical evidence on security price adjustment to information. In doing so, Fama (1970) describes an efficient market as one in which available information is 'fully reflected' in prices, and suggests the now famous classification of tests of market efficiency into weak form, semi-strong form and strong form. The weak form tests examine the ability to use historical stock prices to

predict future returns; the semi-strong form tests investigate the extent to which current market prices fully reflect publicly released information; and the strong form tests consider the degree to which all public and private information is incorporated into current stock prices.

In order to test the efficient markets theory, an assumption must be made about the price formation process in order to compare observed returns against a benchmark. The development of equilibrium models of asset pricing followed from the rational expectations hypothesis proposed by Muth (1961) whereby agents use prices and their own private information to formulate subjective beliefs and undertake actions. Most tests of market efficiency are essentially joint tests of market efficiency and an asset pricing model of expected returns (Fama, 1970). Two alternative equilibrium frameworks for modelling asset pricing are the rational expectations (competitive) equilibrium and the Bayesian Nash (strategic) equilibrium. In the rational expectations equilibrium framework, investors are assumed to be price-takers, accepting the stock pricing function of all investors as given, whereas in the Bayesian Nash equilibrium concept, investors are assumed to consider the impact of their actions and the actions of other investors in their trading decisions (Brunnermeier, 2000). The capital asset pricing model is a commonly used rational expectations model of market equilibrium that expresses the expected returns for a stock in terms of its risk (Lintner, 1965; Sharpe, 1964).

While the early efficient markets theory assumes that security trading transactions costs are zero, information is freely available, and that investors have homogeneous information and expectations about current and future prices, further theoretical developments relax such restrictive assumptions. Jensen (1978) suggests a less stringent definition of market efficiency which infers that stock prices will adjust to new information to the point that it is not possible to earn risk-adjusted profits net of information and trading costs. Similarly, Lesmond, Ogden and Trzcinka (1999) find that the value of an announcement must exceed the transactions costs of trading to induce informed investors to trade. In their noisy rational expectations model in which market prices are only partially revealing, Grossman and Stiglitz (1980) show that given the existence of costly information, there are returns to information gathering and an equilibrium condition exists where prices are partially revealing.

Reviewing the empirical event study research, Fama (1991) observes that in addition to finding evidence of stock price movements, many event studies have found that

information events are associated with higher volatility, being increased dispersion of stock returns. Findings of this nature range from event studies of market reactions to earnings announcements (e.g. Beaver, 1968; Patell & Wolfson, 1984) and stock split announcements (e.g. Fama, Fisher, Jensen, & Roll, 1969), to more recent research into market effects of monetary policy disclosures (Bomfim, 2003), R&D progress announcements (Xu, 2006) and managerial actions undertaken by internet firms engaged in e-commerce (Rajgopal, Venkatachalam, & Kotha, 2002). Nevertheless, the extent to which event-induced volatility is due to rational expectations of increased uncertainty or to irrational over- and under-reactions to news, remains a topic of investigation (Fama, 1991).

Much of the theoretical asset pricing literature assumes that disagreement between investors arises from the possession of private information whereby speculators attempt to infer information from the behaviour of informed investors and from stock prices (Harris & Raviv, 1993). Kyle (1985) introduces a model of strategic trading consistent with semi-strong market efficiency. Informed traders execute their trades slowly, so that their trading activities are disguised by or indistinguishable from those of the noise traders who possess no new information. Further extensions of this model find that price changes may incorporate information slowly over time, thus resulting in price continuations (e.g. Barclay & Warner, 1993; Foster & Viswanathan, 1996). More recently, a strategic model by Brunnermeier (2005) implies that pre-announcement information leakage has the effect of reducing post-announcement price informativeness and informational efficiency. Hence empirical findings of price continuations around public announcements may either be due to prices partially revealing the private information of informed traders through trading prior to the announcement, or to strategic trading behaviour of the informed investors.

In other theoretical models, disagreements between investors concerning the interpretation of public signals may lead to trading activity and increased volatility around public announcements (e.g. Harris & Raviv, 1993; Kandel & Pearson, 1995; O. Kim & Verrecchia, 1991a, 1991b, 1994). For example, Harris and Raviv (1993) consider the effect of speculative trading to explain the findings from previous empirical research that stock markets react to public announcements of new information. Public announcements may provide informed traders with opportunities to process information further and make informed judgements. In such cases, information asymmetries may result as a consequence of investors' different interpretations of the news. Some empirical evidence appears to support their argument that diffuse investor beliefs may

stimulate speculative trading and greater stock price volatility (Boehme, Danielsen, & Sorescu, 2006). One outcome of the Harris & Raviv (1993) model is that trading volume and absolute price changes are positively correlated. In some empirical research, abnormal trading volume has been used to measure the information content of events (e.g. Beaver, 1968; Morse, 1981), while trading volume and changes in abnormal trading activity are found to be positively associated with investor disagreement (e.g. Comiskey, Walkling, & Weeks, 1987; Ziebart, 1990). However, Jones, Kaul and Lipson (1994) caution that abnormal trading volume is not an appropriate measure of the information content of events because the observed positive correlation between trading volume and price changes is caused solely by their positive relationship with the quantity of daily information arrivals. Accordingly, trading volume may be a noisy proxy for the information content of events.

Contrary to some of the disagreement models, the no-trade theorem states that information asymmetries between investors will not necessarily induce trading activities. Using a dynamic rational expectations model, Milgrom and Stokey (1982) show that when investors share common knowledge of the market structure, prices are fully revealing so that any private information is instantly incorporated into prices and cannot be used to induce others to trade. Bhattacharya and Spiegel (1991) extend the no-trade theorem further with a noisy rational expectations model and find that traders who are severely informationally disadvantaged will refuse to trade with an informed insider. Morris (1994) finds that relaxing earlier model assumptions of common prior beliefs to allow for differences of opinion will not necessarily induce investors to trade.

An important implication of the efficient markets hypothesis is that stock market prices change quickly and efficiently as a result of the arrival of new information (Fama, 1991). However, transactions and trading costs may prevent the immediate adjustment of prices to new information, as trading will only take place if the benefits from trading exceed the costs. Prices may also be slow to adjust when information asymmetries exist whereby some investors possess and trade upon private information. Increased price volatility and trading volume may be driven by investor disagreements concerning the interpretation of public information releases or when uninformed noise traders engage in trading activities. Nevertheless, the no-trade theorem implies that new information, information asymmetry and differences of opinion are not sufficient to explain what drives trading volume.

3.4.2 The information content of firm-specific environmental disclosures

Research into environmental announcements has tended to focus on negative news that forebodes increased future costs. Large environmental accidents such as the 1984 Union Carbide Bhopal chemical leak and Three Mile Island (TMI) nuclear accident have resulted in highly negative abnormal stock returns for the accident-site companies and their industry counterparts (Blacconiere & Patten, 1994; Bowen, Castanias, & Daley, 1983; Hill & Schneeweis, 1983). Similarly, the 1982 Tylenol poisoning incident in the US resulted in a negative abnormal return of 28.9 percent over a 28 day period for the shareholders of the drug's manufacturer, Johnson & Johnson Company (Dowdell, Govindaraj, & Jain, 1992). The findings from these studies suggest that expectations of direct costs of remediation and litigation as well as future political and regulatory costs affect accident-site company returns.

Studies of the capital market impact of pollution and environmental compliance news have produced mixed results. US studies by Hamilton (1995) and Shane and Spicer (1983) of firm-level pollution news find a negative impact on abnormal stock returns that is lessened if prior firm-specific pollution information has previously been available to investors. Similarly, Hughes (2000) provides evidence of a negative share price impact of a nonfinancial measure of non-balance sheet environmental liabilities. In contrast, Laplante and Lanoie (1994) find little evidence of abnormal losses in response to the publication of five Ministry of the Environment of British Columbia (Canada) polluters lists between 1990 and 1992. Karpoff, Lott and Wehrly (2005) find a market value loss to firms prosecuted for environmental violations approximately equal to the amount of the legal penalties imposed by the courts, and conclude that any reputational penalties imposed by the markets are negligible. Other research evidence endorses a view of negative stock market sentiments in response to news of firm participation in climate-related and other voluntary environmental certification activities (Canon-de-Francia & Garces-Ayerbe, 2009; Fisher-Vanden & Thorburn, 2010).

Yet not all environmental news is necessarily viewed negatively by the markets. Some voluntary environmental disclosures have been found to be associated with more precise analysts' earnings forecasts, increased market values and reduced costs of capital (e.g. Aerts, Cormier, & Magnan, 2008; Marshall, Brown, & Plumlee, 2009). Disclosures that reveal sound environmental risk management practices may signal to investors company policies that mitigate environmental risk exposure (Blacconiere &

Northcut, 1997; Blacconiere & Patten, 1994; Klassen & McLaughlin, 1996). In a US study more closely related to this thesis, Johnston, Sefcik and Soderstrom (2008) study the market value implications of US sulfur dioxide (SO_2) emission allowance news. They describe the cap and trade emission allowance trading scheme that has been in effect in the US since 1995, whereby the US Environmental Protection Agency (USEPA) allocates a limited number of emissions allowances free of charge to electric utility firms. Each allowance gives the holder the right to emit one ton of SO_2, and given that allowances are fully tradable, any deficiencies (or surpluses) can be purchased (or sold) in USEPA-sponsored auctions. These allowances are valued in the financial statements of the utilities at cost, but only if they are purchased. Surplus allowances have two sources of value, being the avoidance of future emissions costs and the deferral of pollution-abatement equipment costs. Event study methodology is used to test the hypothesis that the news of purchases of SO_2 emission allowances evokes a positive stock market reaction. On the emission allowance auction day, although purchasing firm stocks experience significantly positive abnormal returns, statistically they are no different from the abnormal returns of a matched control sample of non-purchasing utilities.

In summary, the markets appear to view news of pollution and environmental violations negatively. However, the evidence on market reactions to voluntary environmental disclosures is mixed, suggesting that the perceived net benefits or costs may depend on the nature of the environmental activities.

3.4.3 The influence of news characteristics

Particular news characteristics relating to an announcement may shape the magnitude and speed of the stock market reaction to new information. Characteristics that have drawn the attention of researchers are the degree of uncertainty surrounding an event, the precision of an announcement, and the market interpretation of the news as good or bad.

The testing of market efficiency has frequently used the capital asset pricing model to assess expected returns, yet if it fails to capture all elements of expected risk associated with an announcement, then risk may not be fully priced. In such a case, the finding of abnormal returns or volatility associated with an event may be due to the inadequacy of the model's risk measure. Consequently, the implications of uncertainty

and information precision have been considered by researchers. In a seminal theoretical article, Ross (1989) finds that in a no-arbitrage setting, stock price volatility is directly related to the rate of information flow to the market. Prices change only when uncertainty-resolving information affects future cash flows. Brown, Harow and Tinic (1988) propose and find some support for the uncertain information hypothesis, which suggests that a noisy information surprise may induce increases in stock variability and expected returns. Risk-averse investors initially appear to underreact to the signal, but as the uncertainty is resolved, prices on average adjust positively. In the context of earnings announcements and insider trading events, Cai, Faff, Hillier and Mohamed (2007) present empirical evidence that low information quality before events has led to strong changes in firm-level systematic risk.

Empirical evidence supports the view that in circumstances of high information uncertainty, the ability of investors to accurately assess the implications of news may be impaired, leading to expectational errors and subsequent price corrections (Liu, 2006; X. F. Zhang, 2006). Using event study methodology, Xu (2006) examines the progress of corporate R&D announcements in the biotech industry and finds that post-announcement volatility decreases while post-announcement abnormal returns increase through the R&D stages. Xu (2006) concludes that R&D progress contains important information that reduces uncertainty, particularly in the later stages. Durnev and Molchanov (2008) produce evidence that the speed of stock price adjustment to positive firm news increases during the first year of post-IPO trading. They attribute their findings to reduced uncertainty surrounding announcements as firms age.

Kim and Verrecchia (1991b) propose a two-period rational expectations model with differentially informed investors to study the effect of the precision of information on the price and volume reactions to public announcements. They show that more precise announcements generate greater volume and price change variance than less precise announcements, while greater pre-announcement public and private information induces weaker volume and price change variance. While trading volume and absolute prices changes are positively correlated, Kim and Verrecchia (1991b) contend that price change is likely to be a less noisy proxy for the precision of a signal than trading volume.

Yet the influence of information precision on prices and trading is further complicated by the degree to which the new information is anticipated. Kim and Verrecchia (1991a) argue that the prospect of an imprecise announcement gives little incentive for

investors to acquire private information prior to the announcement, so information asymmetry between investors is not great and trading activity remains low. However, the prospect of an extremely precise public announcement dominates investors' beliefs, providing little incentive for pre-announcement private information gathering, resulting in low information asymmetry and low trading volume. So only between the two extremes would there exist incentives to trade. In contrast, McNichols and Trueman (1994) develop a model in which an upcoming public announcement stimulates investors to acquire private information and trade on it before the public disclosure. They argue that the greater the expected precision of the public announcement, the stronger the trader's motivation to engage in pre-event information gathering. So, as the probability and precision of a public announcement increases, the absolute stock price change (volatility) increases prior to the announcement and decreases after the announcement. So the foregoing theoretical research seems to imply that the prospect of a moderately precise announcement may stimulate some investors to gather private information and engage in pre-announcement trading which leads to stock price volatility. However, this may not be the case when the information in an upcoming announcement is expected to be extremely precise or very imprecise.

Empirical evidence supports the view that the degree of precision of news announcements may influence the speed and magnitude of price adjustments to news. Bulkley and Herrerias (2005) investigate the market reaction to the precision of a profit warning. The precision is classified according to whether the content of a warning is quantitative (a new earnings forecast) or qualitative. Abnormal returns around a qualitative warning are found to be slightly more negative than those following a quantitative earnings revision forecast. The effect is more pronounced for small firms. The finding that cumulative abnormal returns (CARs) remain much more negative for qualitative warnings for the period up to three months after the warning is considered to be evidence of underreaction to qualitative public news. Several other studies also find evidence of short-term, post-announcement price continuations (e.g. Ball & Brown, 1968; Bernard & Thomas, 1989; Vega, 2006; X. F. Zhang, 2006).

However, the speed of price reactions to public announcements may be different according to whether the news is good or bad. Woodruff and Senchack (1988) find that the speed of stock price adjustments to earnings surprises is faster for positive earnings surprises than for negative earnings surprises. Using monthly data, Chan (2003) finds strong stock price drift following bad public news headlines, with underreactions observed predominantly for smaller illiquid firm stocks. In both of these

papers, the authors conjecture that the adjustment differences may be due in part to higher costs and constraints to short-selling after bad news compared to buying after good news. When large price changes are accompanied by news reports, Pritamani and Singal (2001) present evidence of strategic trading by investors that results in the slow incorporation of information into prices over time, with the magnitude of 20-day post-event abnormal returns being larger for negative events than for positive events. Short-run stock price reactions to dividend omission news are found to be of greater magnitude and with longer post-announcement price drifts than reactions to new dividend initiation news (Michaely, Thaler, & Womack, 1995). These findings are also consistent with evidence presented in support of theoretical models suggesting that volatility is greater for negative shocks (Engle & Ng, 1993).

On balance, the research literature presented above suggests that greater uncertainty surrounding information events and less precise announcements may induce higher stock return volatility and slower speed of price adjustment. Furthermore, bad news is incorporated into stock prices more slowly than good news, possibly due to trading costs and constraints.

3.4.4 The influence of news dissemination

Short-horizon capital market reactions to firm-specific announcements may be influenced by the degree to which the announcement is anticipated, and the extent to which it is reported in the media. Kothari and Warner (2004) point out that by measuring the unanticipated impact of a corporate event on firm claimholders' wealth, event studies can give useful insights into corporate policy decision-making.

Using a theoretical model, Kim and Verrecchia (1997) distinguish between private pre-announcement information gathered prior to an anticipated public disclosure, and private event-period information used together with the announcement. Anticipated events are considered to induce investors to gather pre-announcement private information while event-period private information is used by investors who have different interpretations of the public disclosure. They show that at the time of the announcement, trading volumes and absolute stock price changes are positively related when traders possess solely pre-announcement private information but unrelated when traders have only event-period private information. In both cases, investors engage in trade as a result of the announcement, but when investors only

possess event-period private information, their trading actions may not necessarily result in price changes. Empirical evidence of increased trading volume before unanticipated announcements, and increased volatility afterwards, are consistent with the above theoretical propositions (Bomfim, 2003; Chae, 2005; Chava & Tookes, 2007).

Yet uniformed investors may expect informed investors to be motivated to trade prior to scheduled announcements. Black (1986) and Wang (1994) argue that as information asymmetry between uninformed and informed investors increases, uninformed investors become aware of the risks that they face in trading with the informed investors, so trading volume decreases. However, when they do trade, the uniformed investors demand a price discount to trade against the informed investors, so that trading volume and absolute price changes are positively correlated (Wang, 1994). Empirical findings by Chae (2005) confirm that trading volume drops prior to scheduled announcements, but increases before unscheduled announcements.

One observation from some of the foregoing research is that trading volume and absolute price changes are positively correlated. Note that this does not necessarily imply that one causes the other. In a survey article on the relationship between price changes and trading volume, Karpoff (1987) concludes that trading volume and price changes are jointly determined through information flows. He also suggests that previous research findings of an asymmetric volume-price change relationship are explained by the existence of trading restrictions faced by investors due to the high cost of short selling.

The empirical literature suggests that the market may anticipate some of the information to be released in announcements. As a consequence of other earlier-disseminated information such as interim earnings reports, most of the information content of annual earnings announcements is already impounded into stock prices by the announcement date, having been anticipated by the market (Ball & Brown, 1968; Beaver, 1968). From an analysis of excess returns arising from industrial firm announcements of increased or decreased capital expenditures, Blose and Shieh (1997) conclude that capital expenditure announcements were largely anticipated for increases in the capital budget, but not for decreases. However, stock price adjustments may also arise prior to a public announcement as a consequence of insider trading on private information (Bhattacharya, Daouk, Jorgenson, & Kehr, 2000; Meulbroek, 1992).

Further empirical research has examined the extent to which stock price volatility is affected by the market's anticipation of events. Although he looks at macroeconomic rather than corporate announcements, Bomfim (2003) finds that volatility is abnormally low before scheduled monetary policy announcements, and abnormally high on announcement/decision days. High announcement day volatility may occur due to the 'news' effect while investors are processing the information. If decisions that are anticipated by the market are excluded, then the observed event-day volatility is even greater. The effect of information is asymmetric, with positive surprises resulting in a larger increase in volatility than negative surprises. French and Roll (1986) observe that stock price volatility is higher during periods when the stock market is open. Given that private information is revealed through trading activity whereas public information is released before, during and after trading hours, they attribute most of the differences in volatility to these differences in information flows. The implication is that private rather than public information is driving volatility.

In an efficient market, stock prices will reflect information quickly and in an unbiased manner. Media news coverage has been used as a proxy for information available to investors and its relationship with the information diffusion process has been of interest to researchers (e.g. Klibanoff, Lamont, & Wizman, 1998; Mitchell & Mulherin, 1994). Media announcements have been found to be weakly positively correlated with event-period abnormal returns (Bhattacharya, Galpin, Ray, & Yu, 2009) and some measures of volatility (Mitchell & Mulherin, 1994), yet strongly positively related with the magnitude of event-day price changes and firm size (Durnev & Molchanov, 2008). In contrast, Berry and Howe (1994) find an insignificant relationship between the rate of public information flow and intra-day price volatility. Differences in measures of media coverage and volatility appear to explain the apparent discrepancies between the research results. A proposed implication of the positive relationship between media coverage and firm size is that the media is more inclined to report news of large firms (Thompson, Olsen, & Dietrich, 1987).

Empirical research also indicates that media coverage may strengthen the magnitude and/or speed of price reactions to information (Durnev & Molchanov, 2008; Klibanoff et al., 1998; Pritamani & Singal, 2001). Huberman and Regev (2001) document stock price changes induced by the May 1998 media publicity of a potential cure for cancer that had been first reported in an academic journal and multiple newspapers over five months earlier in November 1997. The authors conclude that the market underreacted

to the first reports of the news event, and then overreacted to the subsequent media publicity of the same event.

The foregoing studies infer that an observed stock price reaction to a public announcement can indicate that new, unanticipated information has been transmitted to the market. Trading activity and event-induced stock price volatility may be greater for unanticipated announcements, possibly driven by informed investors trading on private information. The strength and speed of stock market reactions to news events may be influenced by whether the news is interpreted as good or bad, and by the extent of media coverage.

3.4.5 The influence of investors' characteristics

An alternative set of behavioural theories attempt to explain capital market reactions to firm-specific announcements by relaxing the assumption of rational information processing by investors (Brav & Heaton, 2002). An early example is the price overreaction hypothesis proposed by DeBondt and Thaler (1985) who maintain that investors overreact to important surprise events because they place too much importance on recent information and insufficient importance on historical data.

One set of behavioural theories considers that investors possess incomplete information and that their learning process explains stock price movements. Hong and Stein (1999) develop a behavioural model with two types of traders: newswatchers who privately observe new information relevant to stock prices and momentum traders who trade solely from their observations of price movements. It is assumed that the diffusion of private information among newswatchers is gradual, so prices adjust slowly, resulting in price underreactions. Momentum traders view the price changes and following the assumption that further price continuations will arise, they undertake trading actions that cause further short-term serial correlation of returns. Eventually prices overreact, having exceeded long-run equilibrium values, inducing further trading actions that drive prices back toward their fundamental values. Using a Bayesian equilibrium analysis, Lewellen and Shanken (2002) explain how predictability and excess volatility of returns may result from investors learning and updating their beliefs, despite prices moving efficiently in response to news.

Other theoretical literature attempts to explain stock return patterns as arising from investor overconfidence. Daniel, Hirshleifer and Subrahmanyam (1998) present a behavioural theory of capital market effects of investor overconfidence and biased self-attribution. Investors are assumed to be Bayesian optimisers who can react irrationally to private and public information. It is argued that some investors may be overconfident such that they credit too much precision to their private information, and underweight the importance of public information signals. This causes overreaction of stock prices to private signals and underreaction to public information signals. This potentially explains empirical evidence of post-announcement price drifts. The biased self-attribution element of the theory proposes that individuals credit themselves with high ability when the efficacy of their earlier private information trading actions is subsequently confirmed by public news. However, when public news fails to confirm the soundness of their earlier private signal trading actions, an investor's confidence is only modestly hampered. On average, public information can prompt further overreactions. The implication for corporate events is that biased self-attribution may cause short-run momentum effects and long-run price reversals. The behavioural models presented by Odean (1998) reveal that overconfidence of investors induces increased trading volume. Volatility is increased when price takers and strategic-trading insiders are overconfident, but to a lesser degree when market-makers are overconfident.

Other theoretical behavioural models attempt to more directly relate mispricing of risk to investor overconfidence. Bloomfield, Libby and Nelson (2000) develop a formal model with Bayesian rationality in which a trader holds a belief concerning the reliability of available information, and then receives a noisy signal that causes him to adjust his attitude concerning the reliability. Through ‘moderated confidence’, the investor is biased toward his earlier expectation, causing prices to underreact to signals that are reliable and overreact to those that are unreliable. Daniel, Hirshleifer and Subrahmanyam (2001) show that when investor confidence drives mispricing of risk, fundamental/price ratios may more adequately explain risk-adjusted expected returns than systematic risk measures such as beta. They argue that this may be particularly useful for valuation of businesses when investment in intangible assets is high. However, Glaser and Weber (2007) warn that modelling investor confidence according to inaccurate estimation of risk may be misguided. They offer empirical evidence that higher trading activity is associated with higher levels of investor over-confidence but not associated with miscalibration measures.

In summary, behavioural theories seek to explain empirical findings of stock price predictability, post-event drift and excess volatility by relaxing the efficient markets assumption of investor rationality. Reactions to corporate events are considered to be influenced by market participants' biases, over- and under-confidence, incomplete information and learning.

3.4.6 Conclusion on the literature of short-horizon capital market reactions to firm-specific announcements

Overall, Section 3.4 has described a selection of the financial literature regarding the theory and evidence of short-horizon capital market reactions to firm-specific announcements. The empirical and theoretical evidence appear to agree that in the short-term, capital markets react to new, firm-specific information. However, some empirical evidence of abnormal returns and excess volatility around some corporate announcements seems to imply that market efficiency may not hold in its strongest form. The attempt to understand market characteristics and explain anomalous behaviour has seen the development of theories that relax some of the assumptions of the efficient markets theory to allow for the presence of information asymmetries and/or investor biases.

Theoretical and empirical literature have considered the short-horizon market return, volatility and trading volume reactions to new firm-level information given the presence of market imperfections and information asymmetry. Transactions and trading costs may slow the process of price adjustment to new information, while wider dissemination of information may have the opposite effect. Some evidence suggests that uncertainty surrounding a public announcement and imprecise signals may lead to slow speed of price adjustment and low trading volume. Alternatively, when investors disagree about the interpretation of a public signal, trading activity and price volatility may rise as traders attempt to profit from their respective beliefs.

Yet the short-term market reaction to a corporate release will be influenced by the degree to which it has been anticipated by investors. Leakage of information prior to unscheduled events may motivate informed investors to engage in pre-announcement trading, which in turn may prompt increases in price volatility as market participants

attempt to interpret the price changes. Trading volume may increase as informed investors attempt to profit from their private information. Yet before scheduled events, trading activity may decline if investors anticipate reductions in information asymmetry.

Alternatively, if investors are not rational, then the empirical anomalies may be attributable to investor biases. The behavioural finance literature lacks a unifying theoretical model, but nevertheless attempts to present a cognitive rationale for the empirical findings of short-term abnormal market reactions.

The above literature will be used to shed light on the stock market response to resource consent announcements. If news of resource consent progress causes investors to revise their expectations of the amount or risk of future cash flows, then any changes in firm value will be observable through changes in the firm's stock price. Given that the financial dollar cost of the resource consent process is rarely disclosed through any medium, the overwhelmingly qualitative nature of the disclosures may hamper investors' abilities to interpret the financial impact of resource consent announcements (Moneva & Cuellar, 2009). Uncertainty surrounding resource consent information could contribute to increased return volatility and correspondingly higher costs of capital for businesses. Resource consent announcements may well communicate important information to investors about the relative value and/or risk of announcers' expected cash flows, but to date, no empirical evidence of this exists.

3.5 Conclusion

In this chapter, theoretical and empirical literature is discussed with respect to the economic effects of environmental regulation (Section 3.2), the shareholder wealth implications of capital expenditures (Section 3.3), and the short-horizon capital market reactions to firm-specific announcements (Section 3.4). The first two sections inform the first research aim of this thesis which is to examine the impact of environmental regulatory delay on capital market reactions to capital expenditure announcements. The third section adds context to the second thesis research aim which is to investigate the capital market impact of resource consent announcements.

With respect to the firm-level economic effects of environmental regulation, the weight of research evidence has failed to conclusively support either the neo-classical view of net costs, or the Porter hypothesis (Porter & van der Linde, 1995) of potential net

benefits to firms. Through the first research aim, this thesis adds to the body of empirical evidence that sheds light on this debate. In doing so, this research specifically addresses the criticism by Jaffe, Peterson, Portney and Stavins (1995) that past studies have not sufficiently controlled for costs of environmental regulatory delays and litigation.

The literature reviewed in the second section of this chapter investigates the roles of strategic advantages, investment opportunities, free cash flows, firm structure and firm size in explaining the valuation implications of capital expenditures. However, the literature has yet to directly consider the influence of regulatory delay on the wealth effects of capital expenditure decisions. The first research aim of this thesis addresses this issue to fill the gap in the literature.

In the third section of this chapter, literature is described that considers factors that influence capital market reactions to firm-specific disclosures. This includes a discussion of the role of environmental disclosures in disseminating information. If the criticisms, described in Chapter 2, of excessive delays and costs in connection with resource consents are valid, then resource consent announcements may play an economically valuable role in reducing information asymmetry by providing timely, new information concerning future environmental compliance costs to the market. Given that this issue has not yet been examined by researchers, the second research aim of this thesis is to investigate the capital market impact of resource consent announcements.

Chapter 4: Hypotheses and data

4.1 Introduction

This chapter introduces the hypotheses to be tested in this thesis to meet the two research aims concerning the capital market economic implications of resource consent information. The following section then discusses the rationale for the choice of methodologies used, and the next section describes the data, data sources and sampling procedures employed to test the hypotheses.

4.2 Hypothesis development

Notwithstanding a dearth of empirical evidence, New Zealand media reports have blamed the implementation of the RMA and resource consent application process as the source of onerous compliance costs for firms undertaking capital investment projects. This is consistent with a neo-classical economics view which suggests that environmental regulations impose net compliance costs that reduce the wealth of affected firms (e.g. Konar & Cohen, 2001; Walley & Whitehead, 1994). Yet, an increasingly substantial body of literature suggests circumstances in which environmental regulations and capital expenditures may positively affect firm value (e.g. Bernardo & Chowdhry, 2002; Chen et al., 2007; Hart, 1995; Helland & Matsuno, 2003; Johnston, 2005; Maloney & McCormick, 1982; Mason & Polasky, 1994; Nehrt, 1996). In this thesis, regulatory delay, measured as the expected time to gain resource consent approval, is considered to be an indicator of expected resource consent compliance costs. Hence, the first key research aim of this thesis is to examine the impact of environmental regulatory delay on capital market reactions to capital expenditure announcements by NZ listed companies. From this first research aim, three testable hypotheses are derived as described below.

The first hypothesis involves testing the relationship between the expected and actual time to gain resource consent approval. Virtually all major proposed capital expenditure projects in New Zealand have an environmental impact that must be assessed for compliance with the RMA. As such, firms undertaking new projects incur resource

consent processing costs unless they are able to purchase the consent together with the real assets as a going concern from another firm. Scant empirical evidence of project-level resource consent compliance costs is available through academic literature or published company financial statements, however, as discussed later in this chapter, as the time to gain consent approval increases, total compliance costs increase (Office of the Associate Minister for the Environment, 2004). Hence the time to obtain resource consent approval can be viewed as an indicator of resource consent compliance costs. Accordingly, a composite variable, the expected time for a project to gain consent approval, *ETC*, and a related dummy variable *ETCDUM*, are constructed to take account of investors' expectations of each project's consent compliance costs at the time of the project initiation announcement. The rationale and details for the construction of the *ETC* and *ETCDUM* estimates are presented later in this chapter, but if the *ETCDUM* variable is an appropriate indicator of the time for a given project to gain resource consent approval, then as postulated in hypothesis *H1*, it is expected that there will be a positive relationship between *ETCDUM* and the actual time to either obtain resource consent approval or abandon the project (*TCA*).

H1: The expected time for a project to gain resource consent approval is positively related to its actual time to consent or abandon.

The next two hypotheses involve testing the stock market reaction to new capital expenditure project announcements. The efficient markets hypothesis suggests that market perceptions about the expected future cash flows of a firm are incorporated into the market value of the firm's stock price. So the stock market prices of firms that undertake capital investments that require resource consent approval should reflect the market consensus of the expected long-term prospects of those firms. Following Woolridge and Snow (1990), alternative shareholder value maximisation and rational expectations hypotheses are presented regarding the relationship between project initiation announcements and stock market abnormal returns. Both theories imply that the expected net present value of a given project should be reflected in the abnormal returns on the project initiation announcement day. However, the two theories differ with respect to the ease with which it is possible to consistently earn above-average returns. Under the shareholder value maximisation hypothesis, if a firm is able to undertake a strategic investment that enables it to gain a competitive advantage, then the expected project NPV would be greater than zero. Hence, the shareholder value maximisation hypothesis (*H2*) suggests that investors will react positively to announcements of new capital expenditures. In contrast, the rational expectations

hypothesis (*H3*) suggests that competitive pressures tend to drive project NPV's to zero, so that project announcement abnormal returns will be zero. Corollary predictions are presented for each hypothesis regarding the expected impact on project announcement abnormal returns of resource consent compliance costs as proxied by the *ETCDUM* variable.

H2: Shareholder wealth maximisation hypothesis: The stock market reaction to capital expenditure project initiation announcements is positive.

H2a: The event-window abnormal returns are greater for projects with higher expected resource consent compliance costs.

H3: Rational expectations hypothesis: The stock market reaction to capital expenditure project initiation announcements is neutral.

H3a: The event-window abnormal returns are equal to zero, irrespective of the expected size of project resource consent compliance costs.

The corollary predictions are presented in *H2a* and *H3a*. If firms' investments in projects with higher resource consent compliance costs (as proxied by the *ETCDUM* variable) allow them to create sustainable advantages that are not easily replicated by their competitors, then high consent cost projects will have larger positive abnormal returns (*H2a*). In contrast, under the rational expectations hypothesis the corollary prediction is that project announcement abnormal returns are unaffected by expected resource consent costs. Assuming rational actions by managers, firms will not undertake new, negative NPV projects. Even projects with higher expected resource consent compliance costs will only be initiated if the expected NPV is greater than or equal to zero. Nevertheless, in a competitive market, actions by industry competitors and new entrants imply that project NPVs and abnormal returns are driven to zero (*H3a*).

The second key research aim of this thesis is to investigate the capital market impact of resource consent announcements by studying the stock market reaction to listed company resource consent announcements. Companies listed on the New Zealand stock exchange must disclose price-sensitive information immediately as it becomes available, but the nature of resource consent information disclosed to the market is overwhelmingly non-financial, usually involving discussion of resource consent

progress. Some research evidence suggests that market prices may be slow to react when information uncertainty is high (X. F. Zhang, 2006) or disclosures are imprecise (Bulkley & Herrerias, 2005). Moneva and Cuellar (2009) find that non-financial disclosures of voluntary environmental activities are not value relevant, and suggest that lack of uniformity of reporting standards may impede investors' ability to interpret the information. This thesis adds further research evidence of the economic importance of environmental disclosures by studying the stock market reaction to resource consent announcements. The degree of information uncertainty surrounding resource consents may be affected by the news characteristics and breadth of dissemination of the announcements, so consideration is given to the influence of these factors on investors' reactions. To achieve the second research aim, the information content of resource consent announcements is first considered in hypotheses *H4* to *H6*. The economic impact of resource consent announcements is then investigated in hypotheses *H7* to *H10*.

Prior to formulating the information content hypotheses, stock market trading activity is explored, as abnormal trading volume may reflect the information content of announcement (Beaver, 1968; Morse, 1981). An announcement may induce increased event-day trading activity for scheduled announcements (Chae, 2005), possibly due to disagreements between investors (Harris & Raviv, 1993) or over-confidence of investors (Odean, 1998). Alternatively, the existence of greater preannouncement public and private information (O. Kim & Verrecchia, 1991a), the ability of informed investors to disguise their trading activities prior to an announcement (Kyle, 1985), or investor inattention (e.g. Hong & Stein, 1999; Huberman & Regev, 2001) may lead to the observation of no abnormal trading volume around a public announcement. Given the mixed evidence with respect to volume, and given the difficulties to distinguish some resource consent announcements as anticipated or otherwise, no predictions concerning volume will be made. However, some exploratory consideration of volume will be undertaken in an attempt to shed light on the information diffusion process in connection with resource consents.

Hypothesis *H4* directly tests the information content of resource consent announcements. If resource consent announcements have economic implications, then on average, evidence of price movements are expected on the announcement dates (Fama, 1991). However, it is unclear whether, on average, net gains or losses in cash flows would be experienced by resource consent announcers. Some resource consent announcements are expected to be interpreted as good when favourable news is

reported, such as when an Environment Court appeal against a resource consent is dismissed, or when a resource consent has been secured to allow an important investment project to proceed. In such cases, the announcements signal that most of the regulatory compliance costs have already been incurred, so stock price increases would be expected. Other resource consent announcements could be viewed as bad news when for example, progress of an application is impeded, or a resource consent is denied. In this case, stock price declines may suggest that the market expects future compliance costs will increase. In other announcements, such as when multiple consents are discussed, the valuation implications may be uncertain or offsetting. Given potentially offsetting effects of stock price reactions to resource consent announcements, the absolute values of abnormal returns are pooled over the sample as in Bhattacharya, Daouk, Jorgenson and Kehr (2000). Stock return volatility has been directly related to the rate of information flow to the market and has been suggested to represent dispersion of investor beliefs (e.g. Harris & Raviv, 1993; Ross, 1989). If on average, the announcements provide the markets with new, unanticipated information, then as postulated in hypothesis *H4*, there should be evidence of significant volatility on the event day:

H4: The event-day absolute abnormal returns of resource consent announcements are significantly greater than zero.

Hypothesis *H5* posits that changes in the business environment over the research period may affect observed stock price volatility. Four major events during this period are identified as potentially affecting reactions to resource consent announcements; the December 2002 New Zealand ratification of the Kyoto Protocol; the December 2002 introduction of enhanced NZX disclosure rules; the changes to the resource consent process following the Resource Management Amendment Act 2003 (No.2) and the Resource Management Amendment Act 2005 (No. 87). Firstly, the ratification of the Kyoto Protocol may potentially cause a redistribution of wealth between firms depending upon their holdings of carbon credits. This suggests that transfers of wealth between potential producers and reducers of greenhouse gases are possible, but the net direction of the overall effect is uncertain. Secondly, the enhanced NZX disclosure rules have reportedly increased the frequency and quality of disclosures (Dunstan, Gallery, & Truong, 2010) and improved the informational efficiency of stock prices through decreased price volatility (Huang, Marsden, & Poskitt, 2008). If the NZX disclosure changes have resulted in increased frequency of disclosures on the resource consent progress of each project, then it is expected that post-reform price

volatility will have decreased. Finally, the RMA legislative changes may have changed the costs associated with obtaining and holding resource consents. The Resource Management Amendment Act 2003 (No.2) was the first wide-reaching reform of the RMA, seeking to reduce costs and delays, improve central government policy tools, broaden the list of matters of national importance, and remedy problems of implementation (Jamieson, 2003). The subsequent 2005 amendments to the RMA sought to further improve the administrative operations of the Act and establish limited priority rights for existing consent holders. On balance, the absolute value of returns is expected to decrease due to improved informational efficiency of stock prices as a consequence of the stock exchange and legislative reforms. Unfortunately there are too few observations to partition the data according to the 2005 RMA amendments, so testing is limited to the effects of the other three reforms. The fifth hypothesis is:

H5: The event-day absolute abnormal returns of resource consent announcements in the post-reform period are lower than those in the pre-reform period.

The next hypothesis tests how the precision of a resource consent announcement may affect its return volatility. The literature reviewed earlier indicates that announcements may differ in their level of precision, with several studies suggesting that noisy information surprises may be associated with higher stock price variability (K. C. Brown et al., 1988; Durnev & Molchanov, 2008; Xu, 2006). Similarly, Bulkley and Herrerias (2005) find that the market reacts more negatively to qualitative profit warnings than quantitative warnings. For the current study, the news classification is suggested as a measure of precision of information. Resource consent announcements are grouped into successful, unsuccessful and uncertain classifications, as described later in the sample construction section. Successful and unsuccessful announcements are posited to be more precise than uncertain announcements. Furthermore, positive and negative shocks may result in different magnitudes of reaction (Bomfim, 2003; Engle & Ng, 1993). Consequently, as posited in hypothesis *H6*, the greater precision of resource consent announcements that report successes or setbacks is expected to reduce event-induced volatility of returns relative to those resource consent announcements that report uncertain or mixed news.

H6: The event-day absolute abnormal returns of successful and unsuccessful resource consent announcements are lower than those of uncertain announcements.

The next three hypotheses, *H7*, *H8* and *H9,* seek to determine how the characteristics of resource consent announcements influence investors' reactions. Johnston, Sefcik and Soderstrom (2008) find that news of purchases of SO_2 emission allowances evokes a positive stock market reaction. Similarly, if resource consent announcements of success signal that regulatory compliance costs are largely sunk, then stock price reactions are expected to be positive.

H7: The event-day abnormal returns of successful resource consent announcements are significantly greater than zero.

In contrast, some research finds evidence of negative capital market reaction to news that signals increased future environmental compliance costs (Blacconiere & Northcut, 1997; Canon-de-Francia & Garces-Ayerbe, 2009; Johnston, 2005). Accordingly, announcements of delays, appeals and monitoring in connection with project resource consents are predicted to result in negative share price reactions if project net present values are expected to be negatively affected through either diminished future cash flows or increased risk.

H8: The event-day abnormal returns of unsuccessful resource consent announcements are significantly less than zero.

Yet, the net direction of market reactions to other resource consent announcements, such as management's initiation of the resource consent process, is difficult to predict. Investors may react negatively at the prospect of lengthy regulatory delays and high environmental compliance costs (e.g. Jaggi & Freedman, 1992; Palmer et al., 1995). Alternatively, market reactions may be positive if net benefits are expected from improved environmental management systems (Hart, 1995; Melnyk et al., 2003) or technological innovation and investment (Helland & Matsuno, 2003; King & Lenox, 2002; Porter & van der Linde, 1995). As a result, no prediction is made for the direction of the stock price reaction to uncertain announcements. However, if as predicted above, success news is positively valued while unsuccessful news is negatively valued, then it is expected that event-day abnormal returns will be lower for unsuccessful announcements than for either successful or uncertain announcements:

H9: The event-day abnormal returns of unsuccessful resource consent announcements are significantly lower than those from successful or uncertain announcements.

Finally, hypothesis *H10* considers how media coverage of a resource consent announcement may affect the stock price reaction. Media coverage of events may be associated with increased magnitude and/or speed of price reactions to information (Durnev & Molchanov, 2008; Klibanoff et al., 1998; Pritamani & Singal, 2001). Note that the direction of reactions to uncertain resource consent announcements is not able to be predicted, and the unsuccessful news group size is too small to allow further partitioning. Accordingly, predictions are limited to the successful news subsample. It is expected that event-day abnormal returns will be greater for successful resource consent announcements that receive contemporaneous media news coverage than for those that do not.

H10: The event-day abnormal returns of successful resource consent announcements that receive contemporaneous media coverage are significantly higher than those that do not receive contemporaneous media coverage.

4.3 Rationale for methodologies employed

Event study methodology is the principal approach employed to test nine of the ten hypotheses associated with the two research aims of this thesis. Event studies have frequently been used to test the company and intra-industry effects of various events and announcements. Although they are not the original pioneers of event studies, Ball and Brown (1968) and Fama, Fisher, Jensen and Roll (1969) have been credited with the seminal research that introduced the methodology most commonly in use today (MacKinlay, 1997). Kothari and Warner (2004) report the publication of 565 event studies in five leading business and finance journals from 1974 to 2000. Share prices, return variances, trading volume, operating performance and earnings management via discretionary accruals are examples of the types of capital market reactions that event studies commonly investigate (Kothari & Warner, 2004). Typical events and announcements studied include earnings, mergers and acquisitions, new debt or equity issues and macroeconomic news (MacKinlay, 1997). Event studies may look at the impact of news that is quantitative, such as in the case of capital investment announcements (e.g., Chen, 2006; E. Jones et al., 2004), or qualitative, such as customer satisfaction reports (e.g., Ittner & Larcker, 1998), innovation or research and development (R&D) news (e.g., Bastin & Hubner, 2006; Liu, 2006; Narayanan, Pinches, Kelm, & Lander, 2000; Xu, 2006); managerial actions (e.g., Rajgopal et al.,

2002) and government import protection decisions (e.g., Hartigan, Perry, & Kamma, 1986).

Some studies use event study methodology to test expectations of the capital market impact of regulatory events as they progress through various stages from pre-legislative publicity through to enactment and amendment (Binder, 1998; Schwert, 1981). Nevertheless, testing of market reactions to legislative progress is not undertaken in this thesis for several reasons. Firstly, rather than evaluating the financial impact of the entire RMA legislation, this thesis is principally concerned with resource consents, which are only a component of the RMA. Secondly, the reputedly enormous costs surrounding resource consents became publicised only well after the implementation of the RMA, so the legislative events are unlikely to coincide with changes in investors' expectations of the impact of the resource consent process. Thirdly, the process of enactment of the RMA and its amendments was protracted and transparent, yet regulatory event studies tend to lack sufficient power to identify abnormal returns when the events have been anticipated by the market (Binder, 1998). The approach taken in this thesis avoids some of these problems by using event study methodology to consider stock price reactions to firm-specific project and resource consent announcements.

4.4 Data, data sources and sample selection: Project initiation announcements

4.4.1 Project initiation announcement sample construction

To test the three hypotheses relating to the impact of environmental regulatory delay on the capital market reactions to firms' capital expenditure decisions, announcements of new capital expenditure projects by NZX-listed firms are collected from the NZX i-Search and IRG Deep Archive databases between January 1991 and August 2007. The start date reflects the year of enactment of the RMA, while the cut-off date is prior to the September 2007 government announcement to implement an emissions trading scheme. This cut-off date is set to avoid possible complications caused by company wealth consequences of the emissions trading scheme. Projects are only considered

for inclusion if resource consent approval to undertake or operate a project is either required or already possessed. Keyword search terms include ‘purchase’, ‘develop’, ‘development’, ‘acquire’ and ‘acquisition’ together with ‘consent’, ‘notify’, ‘non-notified’, and variations thereof. Capital expenditure projects are defined to involve the acquisition and construction of new plant and equipment, and the upgrade of existing tangible capital assets. Following previous studies, the definition of new capital expenditures includes those projects undertaken through joint venture arrangements, but excludes marketable securities acquired through mergers and takeovers (Burton et al., 1999; Del Brio et al., 2003).

From the keyword search, 128 capital expenditure projects are able to be identified. For each project, the initial announcement date is chosen as the earlier of the announcement of the project or the announcement of the resource consent plans. To ensure that the date of the initial announcement is correctly identified, news of each identified project is also searched via the Newztext Plus database, which includes full text coverage of New Zealand newspaper, newswire and magazine reports. As Newztext Plus has limited coverage prior to 1995, the Factiva media database is also used to identify the pre-1995 initial announcements. Similar to Burton, Lonie & Power (1999), the earliest of the NZX i-Search or media reporting date is designated as the event day, focusing upon a two-day (0,+1) event window. Stock exchange announcements after market close are deemed to arise on the next working day.

To be included in the sample, each announcement is required to meet the following restrictions. First, it must be an initial announcement of the proposal or plan to undertake a capital expenditure and/or pursue resource consent approval for which the initiation date can be clearly identified. Five projects are eliminated from consideration as no project or resource consent initiation dates can be identified. Second, no confounding events must occur within plus or minus two days of the announcement (-2,+2). The exclusion window allows for uncertainly concerning the time of day for media releases. Exclusions include other announcements of resource consents, earnings, share repurchases, changes in CEO, other investment and divestment activities, mergers and takeovers, major operational reports, law suits and trading halts. This results in 57 exclusions that may otherwise influence stock prices around the announcement date. Third, announcing firms’ stock must have traded around the time of the announcement (-1,+1). This step is necessary because the later trading day returns of a stock that fails to trade within the event window will reflect the news from several days, so one is not capturing the ‘true’ return during the event window. Another

11 announcements are excluded as a result of this criterion. The application of these screening criteria eliminates 73 projects from consideration, resulting in a sample of 55 non-contaminated announcements by 27 listed companies from August 1992 to July 2007. From each of the 55 qualifying initial announcements, additional information is gathered when available, such as the capital investment size, management's forecast of the expected time to gain consent approval and/or commence operations and whether or not the expenditure involves a joint venture. Summary details of the sample announcements are presented in Appendix 2, while the sample exclusions and number of announcements by year are presented in Panels A and B of Table 4.1. The greatest number of project initiation announcements in any year is 6, reflecting high economic growth in both 2000 and 2004.

In order to test hypotheses *H2a* and *H3a* concerning the valuation impact of expected resource consent compliance costs, a composite variable (*ETC*) is constructed as explained in Section 4.4.3 to estimate regulatory delay as the expected time (in months) to gain consent approval. Panel B of Table 4.1 gives details of the annual number of projects classified as having a short or long *ETC*, relative to the median *ETC* of 11.15 months for the sample of all 46 events for which *ETC* could be estimated. Few *ETC* estimates are able to be made for the projects early in the sample period due to a lack of relevant public information at that time. Consequently, *ETC* estimates are available for 46 out of the 55 projects, over a period from 1993 to 2007.

Panel B of Table 4.1 also reports that 37 (67%) of the project initiation announcements make explicit mention of the related resource consent or consenting process. Virtually all major capital expansion and development projects require resource consent approval under the RMA, so for the remaining 18 announcements which failed to mention the resource consent at the time of the project initiation, in the minds of investors, the need for consent approval would still be implicit. For all of the latter projects, consenting information is disseminated through the media and/or the stock exchange at some stage prior to the commencement of operations. For the sample, the project initiation news is first disseminated solely through the media for 26 projects (47%), solely through stock exchange releases for 16 projects (29%), and concurrently from both sources for 13 projects (24%).

Table 4.1 Project initiation sample analysis

Panel A. Sample exclusions

Total non-duplicated project initiation announcements		128
Less:	initiation date unknown	(5)
	announcements with confounding events, days -2 to +2	(57)
	firm not traded during window (-1,+1)	(11)
Final sample size		55

Panel B. Sample of project initiation announcements by year

	All	Short ETC (< median)	Long ETC (> median)	Resource consent mentioned
1992	2	0	0	2
1993	3	0	1	2
1994	1	0	0	0
1995	4	2	1	3
1996	3	1	1	1
1997	5	3	2	4
1998	3	1	2	1
1999	2	1	1	2
2000	6	3	1	5
2001	1	1	0	1
2002	5	1	4	2
2003	5	3	2	3
2004	6	3	3	4
2005	4	3	1	2
2006	4	1	3	4
2007	1	0	1	1
Total	55	23	23	37

Panel C. Project initiation announcements per company, final sample

Number of announcements per company	Number of companies	Total announcements	
		Number	Percent
1	13	13	23
2	6	12	22
3	4	12	22
4	3	12	22
5	0	0	0
6	1	6	11
Total	27	55	100

Panel D. Industry affiliations of project initiation announcer sample

Datastream Industry Classification Level 2	Number of companies	Total announcements	
		Number	Percent
Basic materials	1	2	4
Consumer goods	1	1	2
Consumer services	3	3	6
Financial services	4	10	18
Healthcare	2	6	11
Industrials	6	11	20
Oil & gas	3	3	5
Utilities	7	19	34
Total	27	55	100

Several companies made more than one project initiation announcement, with several of these qualifying for inclusion in the sample. The greatest number of qualifying project announcements are by TrustPower Limited (6) from 1996 to 2006. Panel C of Table 4.1 presents a summary of the number of qualifying announcements per company.

The industry affiliations of the companies represented in the sample, grouped according to the level 2 Datastream Global Industry Classifications, are presented in Panel D of Table 4.1. Announcements from the utilities industry make up the greatest portion of the sample at 34%, followed by industrials at 20% and financial services (property investment) at 18%. Overall, the sample companies reflect a wide range of capital-intensive industries.

4.4.2 Index construction and announcement returns data compilation

To conduct the event study, a benchmark stock market return is required. Equal-weighted indices yield better-specified test statistics when daily returns are non-normal (Campbell & Wasley, 1993) and event dates are clustered closely in time (Corrado & Truong, 2008). Although they are referring more specifically to long-term event studies, Barber and Lyon (1997) make the point that returns from sample firms are essentially equally weighted, so comparison with an equal-weighted index is appropriate. Similarly, Dimson and Marsh (1986) warn that bias may be introduced in event studies when the sample securities and index securities differ in size or weighting. Furthermore, value-weighted indices are less appropriate for event studies in New Zealand due to the dominance of a few large companies. For example, at times during the 1990s the weightings of three companies, Telecom, Carter Holt Harvey and Fletcher Challenge accounted for approximately half of the highly publicised NZSE40 equity index (Coote, 1996). For this study, the Datastream live and delisted stock return indices series from 1991 to 2007 are used to construct an equal-weighted stock market index. Missing price and/or volume data for a few stocks are obtained directly from the New Zealand Exchange.

The construction of the equal-weighted index is described as follows. In the first instance, days of national holidays are deleted. Then, following the construction methodology of the NZX All value-weighted index (New Zealand Exchange, 2007), only NZX domestically-listed ordinary shares are selected, yielding a total of 221 shares

over the entire sample period. For any given year, the largest number of shares in the dataset is 133 in 2005 while the smallest is 75 in 1992. The next screen is to eliminate the most thinly-traded stocks, as discontinuities in security trading may bias market returns estimated using daily data (Scholes & Williams, 1977). If the volume of trading for a particular firm is not uniform over the trading period, then there may be sub-periods during which trading is infrequent, thereby depressing the index. Hence, it is important to delete non-liquid companies from the equal-weighted market index.

To deal with the liquidity issue, two equal-weighted indices are constructed. For market index one, 28 securities that on average trade on fewer than 40% of available trading days are excluded. This eliminates the most thinly-traded stocks and produces a relatively broad index of 193 stocks that comprises a substantial proportion of the domestic New Zealand stocks in the Datastream database. Nevertheless, the definition of thinly-traded stocks used to compile market index one may not entirely eliminate the problem of thin trading. To test the robustness of results, a second equal-weighted market index is constructed. Starting with the securities in the first market index, a further 18 securities that on average trade on fewer than 60% of available trading days are excluded. This reduces the potential problem of thin and non-uniform trading, however, it results in a market index of 175 stocks that is potentially less representative of the market.

To identify potential errors in the data, the following process is used to test for outliers. To establish the normal range of valid returns, the returns for 10 stocks in the market index are compared with data from IRG and University of Otago databases. Next, all company returns in the index from 1992 to 2007 are filtered for outliers, being defined as daily returns, $r_{it,}$ for given firm i on day t, greater than 130% or less than -56.5%.

Table 4.2 identifies 28 outliers within the market index dataset, of which 15 are deemed correct and 13 incorrect. All known errors in the identified outlier range have been corrected.

The first equal-weighted stock market return index described above is used for the market model abnormal return and market-adjusted return calculations for the event study, while the second equal-weighted market index is used for robustness testing.

Table 4.2 Market index data outlier analysis

	Number of outliers		
Range of outlier returns, r_{it}	Correct	Error	Total
$-67\% \leq r_{it} < -56.5\%$ or $130\% < r_{it} \leq 200\%$	10	5	15
$-75\% \leq r_{it} < -67\%$ or $200\% < r_{it} \leq 300\%$	3	2	5
$-80\% \leq r_{it} < -75\%$ or $300\% < r_{it} \leq 400\%$	2	1	3
$r_{it} < -80\%$ or $400\% < r_{it}$	0	5	5
Total	15	13	28

Daily stock returns for the sample of project initiation announcements are extracted from the market index dataset. Whenever possible, data is collected from 170 days before to 10 days after each announcement. For four observations, only shorter time series are available, ranging from 43 to 162 days prior to the announcement.

4.4.3 Expected time to gain resource consent variable construction

As summarised in hypotheses *H2a* and *H3a*, the shareholder wealth maximisation and rational expectations hypotheses imply different predictions regarding the shareholder wealth effects of expected resource consent compliance costs for new capital expenditure projects. To test these hypotheses, a measure is needed of expected resource consent compliance costs at the time of project initiation. The rationale for the measure and its development are discussed below.

The connection between resource consent compliance costs and consent-processing time is noted by the Ministry for the Environment in a 2004 Cabinet briefing paper (Office of the Associate Minister for the Environment, 2004). This paper proposes legislative changes (later enacted in the RMAA 2005) to improve environmental decision-making and reduce RMA costs and delays. In that document, the Ministry asserts that increases in compliance costs occur when consent-processing time limits are exceeded, public consultation is required, decisions are appealed to the Courts, or the duration of the consent is reduced. The paper indicates that for large, complex projects, the consenting process can impose delays that increase project-related holding and opportunity costs. Furthermore, the Ministry contends that it "is difficult to assess the influence that negative perceptions of the RMA have on investment certainty and decision making. However, the time an application takes to be granted is a useful indicator of compliance costs under the RMA" (Office of the Associate Minister for the Environment, 2004, p. 6).

To consider this point further, Table 4.3 outlines in chronological order the various sources of resource consent compliance costs and classifies them as time varying, time invariant or mixed. Timing-varying consent costs increase as consent-processing time increases, time-invariant consent costs do not change with time, while mixed costs contain both time-varying and time-invariant elements.

Most resource consent compliance costs listed in Table 4.3 arise between the time of the project plan announcement and the resource consent approval date, and are time-varying. Timing-varying consent costs include consultants' fees, opportunity costs of employees' time, council hearing-related fees, costs of gathering additional information, consultation costs, delay-related holding costs and opportunity costs of poor equipment utilisation. Time-invariant consent costs comprise the opportunity costs of Court-ordered changes in consent conditions and mitigation action costs. Finally, council application-related fees, legal costs of appeals, and environmental compliance monitoring costs are mixed costs.

There is further evidence to suggest that the time-varying costs associated with the time required to gain resource consent approval are particularly material. Ministry for the Environment research suggests that costs arising from uncertainties over the timing of consent approval can be great, while administrative processing charges are relatively small (Quality Planning, Undated).

The foregoing analysis lends support to the Ministry for the Environment's statement that the time to gain resource consent approval can be viewed as an indicator of resource consent compliance costs. Accordingly, to investigate the potential financial impact that resource consent compliance costs may induce, a composite variable, *ETC*, is constructed to estimate the expected time (in months) to gain consent approval, based upon public information that investors could reasonably be expected to use at the project initiation announcement date. As summarised in Table 4.4, public information contained in the media or stock exchange announcements may include management forecasts of the expected time to gain consent approval or commence operations, and past projects' actual times to gain consent approval. Except as noted in the table, the Table 4.4 statistics exclude 8 capital acquisitions for which the approved resource consent was purchased together with the capital asset (*ETC*=0).

Table 4.3 Sources of resource consent compliance costs

Source of compliance cost	Cost type	Explanation
Consulting fees	Time-varying	This includes payments to consultants to advise and/or provide services relating to the mandatory assessment(s) of environmental effects and the resource consent application(s).
The opportunity cost of employees' time devoted to the resource consent approval process	Time-varying	Staff resources are required throughout the resource consent process.
Council application-related fees	Mixed	The time-varying portion relates to the cost of public notices and hours required by authority planners, advisors and administrators. Within each authority, the application fee is fixed (time invariant) for each type of consent. However, several applications are needed if the geographical region relates to more than one authority.
Council hearing-related fees	Time-varying	Applicants pay per-hour charges for chairperson, councillors, consultant planners, independent commissioners, compliance officers and administrative officers. Venue hire costs increase as number of hearings increases.
Costs of gathering additional information requested by consent authority	Time-varying	Consent authorities may request further information from the applicant to support their case.
Consultation costs	Time-varying	This includes consultation with interested groups and iwi.
Legal costs of appeals	Mixed	Includes lawyers' and expert witness fees, and contingent costs of court-awarded costs to submitters.
Delay-related holding and opportunity costs	Time-varying	Includes deferral of project revenue and poor utilisation of labour and expensive equipment
Opportunity costs of changes consent conditions	Time invariant	Appeals may result in the changes to the conditions of the consents
Mitigation action costs	Time invariant	To gain consent, an applicant may agree to conditions which seek to mitigate adverse impacts. While the consent conditions are known at the time of approval, the actual costs may be incurred subsequent to approval.
Monitoring costs	Mixed	To gain consent, an applicant may agree to conditions that require them to incur ongoing environmental compliance monitoring costs.

Sources: Office of the Associate Minister for the Environment (2004), Quality Planning (Undated), (Sheppard, 1998)

Table 4.4 Summary statistics and correlations - Expected time to consent (ETC) components and historical time to consent/abandon (TCA)

Variable (months)	n	Mean	Median	Std. Dev.	Min.	Max.	Correlation (ρ) with historical project-level TCA
Panel A: Non-transformed data							
Mgt forecast of ETC	11	11.55	7.00	11.70	2.00	42.00	0.8569[a] (9)
Historical firm-level TCA	22	23.08	12.30	26.65	5.29	86.10	0.2787 (22)
Mgt forecast months to operate	22	25.23	24.00	20.86	3.00	78.00	0.1334 (18)
Historical industry-level TCA	41	16.85	13.81	9.59	6.76	47.05	0.0087 (30)
Historical project-level TCA	41	21.45	13.81	22.71	1.64	111.78	
ETC variable (including ETC=0)	46	18.19	11.15	22.97	0.00	86.10	
ETC variable (excluding ETC=0)	38	22.01	12.00	23.56	2.00	86.10	0.1648 (33)
Panel B: Transformed variables							
LNTCA (historical project-level)	41	2.65	2.63	0.9436	0.50	4.72	
ETCDUM variable (including ETC=0)	46	0.50	0.50	0.51	0.00	1.00	
ETCDUM variable (excluding ETC=0)	38	0.61	1.00	0.50	0.00	1.00	0.4148[b] (33)

[a, b] and [c] denote statistical significance at the 1%, 5% and 10% levels, respectively, using Pearson correlation coefficients

Management information regarding the expected time to gain resource consent approval is available for 19 of the 55 qualifying project initiation announcements. Eight of these are already consented (*ETC*=0) at the initiation date, with the remaining 11 supplying firm management forecasts of an *ETC* greater than zero. As shown in Table 4.4, the mean (median) firm management forecast for projects with positive *ETC* is 11.55 (7.00) months.

Using past projects' actual times to gain consent approval from the stock exchange and media announcements, a historical firm-level median *TCA* (time to consent or abandon) measure is constructed. For each of the 128 capital expenditure projects identified in the keyword search, the resource consent approval date is identified from the stock exchange and media reports as the first reported date that resource consents are granted (with no further appeals outstanding), and/or the date that the project is abandoned. The consent initiation, approval or abandonment date is missing for 29 projects, and resource consent approval is already held at the project initiation date for another 12 projects. Out of the 128 capital expenditure projects, this leaves 87 projects for which both an initiation date and subsequent resource consent approval (83) or abandonment date (4) are able to be identified. For each of the 87 projects, the estimated historical project-level *TCA* is calculated as the difference between the resource consent approval/abandonment date and the project initiation date. Next, to estimate the historical firm-specific *TCA*, the 87 projects are first sorted by firm and then by the resource consent approval/abandonment date. For each firm, this gives time-varying estimates of the historical median *TCA* that are updated each time a new consent is obtained. An estimate of historical firm-level *TCA* is only possible when a prior firm history is available from earlier projects, which in this case is for 22 out of the 55 projects in the sample. Table 4.4 reveals the mean (median) historical firm-level *TCA* to be 23.08 (12.30) months.

Some announcements report firm management forecasts of the expected time for the project to become operational. While this measure overstates the expected time to gain consent approval, it incorporates a component that allows for the resource consent resolution period. Consequently, a positive correlation is expected between the forecast time to commence operations and the expected time to gain consent approval. A management forecast of the time for the project to become operational is available for 22 of the 55 projects. Table 4.4 shows that the mean (median) forecast time to commence operations is 25.23 (24.00) months.

In addition to the above measures, a further industry-based *TCA* measure is devised using the 87 projects for which the estimated historical project-level *TCA* is able to be calculated. The projects are sorted first by industry and then by the resource consent approval/abandonment date to calculate a time-varying median *TCA* for each industry, which is updated as new consents are approved or projects abandoned. This results in historical industry-level *TCA* measures for 41 of the 55 sample projects. Table 4.4 reports the mean (median) historical industry-level *TCA* estimate to be 16.85 (13.81) months.

Four forecast measures have been described above: the management forecast of *ETC*, the historical firm-level *TCA*, the management forecast of the time to commence operations, and a historical industry-level *TCA*. To evaluate which of these forecast measures to incorporate into the *ETC* variable for the 55 sample projects, information is needed regarding the relationship between the forecast versus actual time to consent/abandon at the project-level. The historical project-level *TCA* described earlier measures each project's actual time to consent/abandon. To avoid overstating the correlation coefficient between the forecasts and the historical project-level *TCA*, 8 previously consented projects (for which *ETC*=0) are coded as missing values. Another 6 projects have no known consent or abandonment date, yielding historical project-level *TCA* estimates for 41 of the 55 sample projects. Table 4.4 reveals that the mean (median) historical project-level *TCA* is 21.45 (13.81) months. Table 4.4 also shows that the forecast measure most highly correlated with the historical project-level *TCA* is the management forecast *ETC* (ρ=0.8569, n=9), followed by the historical firm-level *TCA* (ρ=0.2787, n=22), and lastly the management forecast months to operate (ρ=0.1334, n=18). Historical industry-level *TCA* is not associated with project-level *TCA* (ρ=0.0087, n=30) possibly because firm *TCA* varies considerably within each industry and industry samples sizes are very small. Furthermore, a time-varying historical industry-level median *TCA* places weight on early observations, yet the industry-level *TCA* is not stable, varying considerably over the sample period. For example, in those industries categorised as having a long median *TCA* over the entire 1992 to 2007 sample period, the *TCA* from 1997 to 2002 is relatively short. Repeating the correlations of the four component measures with the historical project-level *TCA* using logarithmic transformations results in no change in the rankings of the measures (not tabulated). Given the lack of correlation between historical project-level *TCA* and historical industry-level *TCA*, this measure is not used to construct the *ETC* variable.

To emulate investors' estimates of the expected time to gain resource consent approval, the composite variable, *ETC*, is constructed as follows for any given project in the sample:

1. If the project is already consented at the time of the project initiation announcement, then *ETC*=0. Eight projects fall into this category.

2. If *ETC* is not equal to zero, and if it is disclosed at the time of a project initiation, use the firm management forecast of *ETC*. Eleven estimates result from this step.

3. If an estimate of *ETC* is not available from the application of steps 1 or 2, then use the time-varying estimate of historical firm-level median *TCA* (time to consent or abandon) for past capital expenditure projects. Seventeen estimates are gained from this measure.

4. If an estimate of *ETC* is not available from the application of steps 1, 2 or 3, then use the firm management forecast of the expected time for the project to become operational. Another 10 estimates result from this step.

The *ETC* variable provides an estimate of the expected time in months to consent/abandon for 46 of the 55 sample projects. Table 4.4 shows the mean (median) for the *ETC* variable is 18.19 (11.15) months. The relevant data for the non-zero *ETC* observations is also presented. The sample size for the correlation coefficient between this variable and historical project-level *TCA* is small as there are only 33 observations that have both *ETC* greater than zero and historical project-level *TCA* information. The correlation is modestly positive at ρ=0.1648, however, the *ETC* and historical project-level *TCA* variables are highly non-normal, so transformations are employed to improve consistency with the normality assumptions of the statistical tests. Taking the natural log of the 41 non-zero observations of the historical project-level *TCA* (*LNTCA*) further improves the normality of this variable, as evidenced by the close proximity of the mean and median. To overcome the issue of non-normality for the *ETC* measure, a dummy variable is constructed by partitioning the sample at the median *ETC* of 11.2 months such that *ETCDUM* is equal to 0 if a given project *ETC* is below the sample median *ETC*, and equal to 1 if the project *ETC* is above the sample median *ETC*. The correlation coefficient between *ETCDUM* and *LNTCA* is ρ=0.4148, giving some credibility to proposition that the *ETCDUM* variable may be a reasonable indicator of

actual project-level time to consent or abandon. Investor forecasts of project *TCA* are likely to contain substantial prediction error as does the *ETCDUM* measure calculated here, as actual project time to gain resource consent approval can vary widely within industries and even within firms. If the *ETCDUM* variable is an appropriate indicator of the expected time for a given project to gain resource consent approval, then as postulated in hypothesis *H1*, it is expected that there will be a significantly positive relationship between *ETCDUM* and *LNTCA*.

4.4.4 Control variable sources

Hypotheses *H2a* and *H3a* offer different predictions concerning the effect of expected resource consent compliance costs on event-window abnormal returns. Cross-sectional regression analysis is undertaken to test for differences between the two *ETCDUM* groups, while controlling for firm-specific and other characteristics. Annual firm financial data including book value of total assets, book value of ordinary share equity, number of shares on issue and total liabilities is obtained from the NZX – Deep Archive Service. Market value of equity, market value of assets, trading volume and industry classifications are sourced from the Datastream databases. Additional project-specific information including the capital investment size, joint venture arrangements and resource consent details are obtained from the media or stock exchange announcements as described previously in connection with the sample construction. Further descriptions of the control variables are included in the Chapter 5 methodology discussion.

4.5 Data, data sources and sample selection: Resource consent announcements

4.5.1 Resource consent announcement sample construction

To test hypotheses *H4* to *H10* relating to the second research aim, listed firm resource consent announcements reported to the New Zealand Exchange in the period from January 1991 to August 2007 are collected from the NZX i-Search and the IRG Deep Archive data bases. Resource consent announcements are defined for this study as

news regarding the approval or process for approval of specific resource consents. After deletion of duplicate announcements, 287 resource consent announcements are identified.

The sample is further restricted through the application of the following selection criteria. First, the announcement must relate primarily to resource consent news. Concurrent confounding events on day 0 result in the elimination of 183 resource consent announcements. Second, no other major announcements must occur on the day prior to (-1) or day after (+1) the event date. The stock exchange announcement data captures the time of day of the release, thereby allowing a relatively narrow exclusion window. Exclusions comprise other announcements of resource consents, earnings and dividends, share repurchases, changes in CEO, other investment and divestment activities, mergers and takeovers, major operational reports and law suits. This results in 11 further exclusions. Finally, announcing firms' stock must have traded during the period from one day prior to one day after the event date. Another 3 announcements are excluded as a result of this criterion. Note that announcement dates are adjusted to the next working day for all announcements after market close. After applying these screening criteria, the sample comprises 90 resource consent announcements from 30 companies from 1993 to 2007. The sample exclusions and number of announcements by year are presented in Panels A and B of Table 4.5. The greatest number of announcements in the sample (18) are in 2004, coinciding with a period of high economic growth in New Zealand.

Table 4.5 Resource consent announcements sample analysis

Panel A. Sample exclusions

Total non-duplicated resource consent announcements		287
Less:	announcements with concurrent confounding events, day 0	(183)
	announcements with other confounding events, days (-1, +1)	(11)
	firm not traded during window (-1,+1)	(3)
Final sample size		90

Panel B. Sample of resource consent announcements by year

	All	Successful	Unsuccessful	Uncertain
1993	1	0	0	1
1994	5	1	1	3
1995	5	1	0	4
1996	5	2	0	3
1997	2	1	0	1
1998	3	1	0	2
1999	7	2	1	4
2000	4	3	0	1
2001	3	1	0	2
2002	3	3	0	0
2003	16	10	2	4
2004	18	11	0	7
2005	9	4	0	5
2006	5	1	0	4
2007	4	3	0	1
Total	90	44	4	42

Panel C. Resource consent announcements per company, final sample

Number of announcements per company	Number of companies	Total announcements	
		Number	Percent
1	13	13	14
2	6	12	13
3	2	6	7
4	1	4	5
5	3	15	17
6	2	12	13
7	1	7	8
8	0	0	0
9	1	9	10
10	0	0	0
11	0	0	0
12	1	12	13
Total	30	90	100

Panel D. Industry affiliations of resource consent announcer sample

Datastream Industry Classification Level 2	Number of companies	Total announcements	
		Number	Percent
Basic materials	4	8	9
Consumer goods	1	2	2
Financial services	6	12	13
Healthcare	2	12	13
Industrials	9	21	24
Oil & gas	3	8	9
Utilities	5	27	30
Total	30	90	100

In order to test hypotheses *H6* to *H10* regarding how news precision, type of news and media coverage affect the short-horizon capital market reaction to resource consent announcements, the 90 announcements are assigned to either a 'successful', 'unsuccessful' or 'uncertain' subsample. An announcement is defined as successful when it reports the approval of an application for resource consent by either government or court authorities with no major conditions, or when it advises the expiration of an appeal period for contesting an approved application for resource consent. Forty-four out of the 90 announcements are classified as successful. An unsuccessful classification is used for announcements of major delays in the process of attempting to gain resource consent approval and/or major appeals lodged against a decision to approve an application for resource consent. Surprisingly, only 4 out of the 90 announcements are classified as unsuccessful. A review of contaminated announcements excluded from the sample suggests no over-representation of negative resource consent news in the contaminated announcements. Finally, announcements are categorised as uncertain when the news is not definitively good or bad. Specifically, announcements are classified as uncertain when they notify the lodging of an application or intent to apply for resource consent approval (26), report consent-related compliance costs, remediation activities, conditions and minor delays (11), or discuss the progress of more than one projects' resource consents (5). Forty-two announcements are classified as uncertain. Panel B of Table 4.5 summarises the number of announcements in each subsample by year and Appendix 3 presents details of these announcements. The categories allow comparisons to be made with previous research which shows that capital market reactions to news may differ according to investors' perceptions of the news as good or bad (e.g. Michaely et al., 1995; Pritamani & Singal, 2001), and precise or uncertain (e.g. Bulkley & Herrerias, 2005; Xu, 2006).

Several companies make multiple resource consent announcements that qualify under the selection criteria above. The most announcements are by Contact Energy Limited with twelve qualifying announcements from 2003 to 2007 and by TrustPower Limited with nine qualifying announcements from 1996 to 2007. A summary of the number of qualifying announcements per company is presented in Panel C of Table 4.5.

Panel D of Table 4.5 indicates the industry affiliations of the companies included in the sample, classified according to the level 2 Datastream Global Industry Classifications. The sample companies reflect a wide range of capital-intensive industries, with announcements from the utilities industry making up 30% of the sample. The financial services category is solely comprised of companies involved in property investment.

4.5.2 Index construction, announcement returns, trading volume and market capitalisation data compilation

The two equal-weighted stock market return indices described in Section 4.4.2 in connection with *H2* and *H3* of the project initiation announcement study are also used for the market model abnormal return and market-adjusted return calculations for testing hypotheses *H4* to *H10* of the resource consent announcement study. The rationale for their use and details of their construction are as described earlier.

To compile the data for the sample of resource consent announcers, daily stock returns and trading volumes (number of shares traded) are captured from the market index dataset described earlier in Section 4.4.2 in connection with the construction of an equal-weighted market index. Given that the market indices exclude overseas issuers, it is necessary to collect the return and volume information for the sole overseas issuer in the resource consent announcement sample, Oceana Gold Limited, from the Datastream databases. Whenever possible, data is obtained for 260 days before and 20 days after each announcement. However, for six stocks, only shorter time series are available, with the shortest being 70 days before the announcement. A liquidity analysis presented in Appendix 4 reveals that thin trading is not a serious problem, with 24 of the 30 sample stocks (80%) being thickly traded over the sample period.

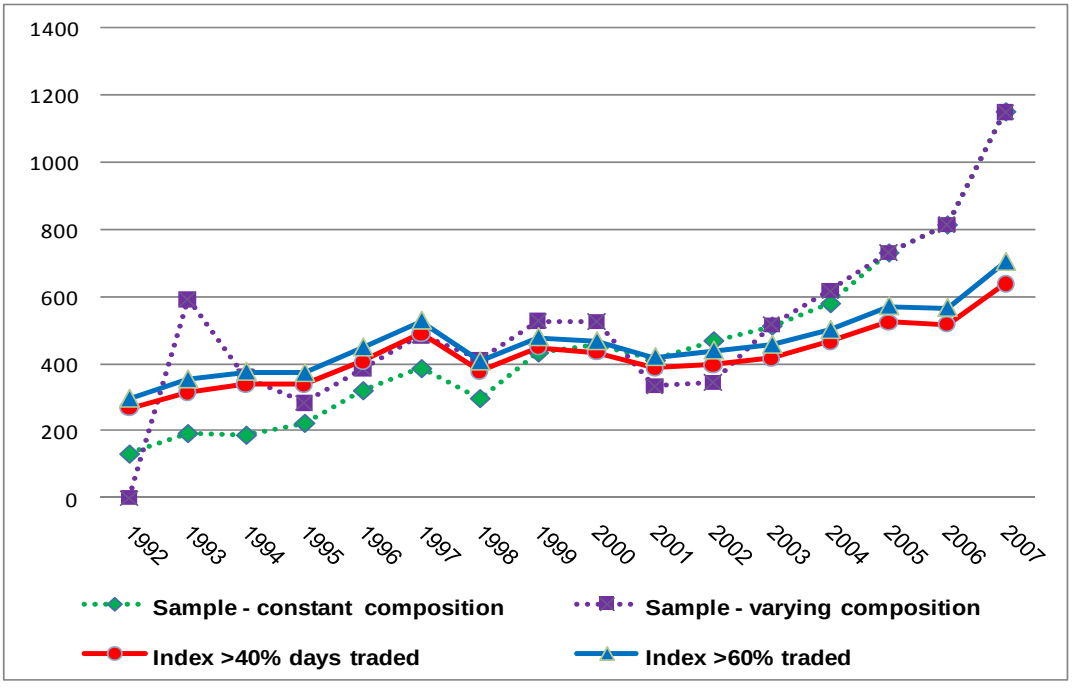
Ideally, the size of sample and market index stocks should be similar to control for the size effect in market model estimates (Dimson & Marsh, 1986). Capitalisation data for the market and resource consent sample firms is obtained from the Datastream databases. The market capitalisation for two representations of the sample is compared to that of the two indices in Table 4.6 and Figure 4.1. The first column, sample – constant composition, summarises the average end-of-June market capitalisation of all sample firms for the duration of the sample period irrespective of the timing of the resource consent announcements. The second column, sample – varying composition, presents the average end-of-June market capitalisation of all sample firms assuming each firm only enters the sample in the month of its first eligible resource consent announcement. For both compositions of the sample, stocks remain in the sample until the earlier of the end of the sample period (August 2007) or their date of delisting. From Figure 4.1, in the early years of the sample period it appears that the average market capitalisations of both compositions of the sample (represented by the

dotted lines) are similar to the first market index (represented by the solid line with round markers). However, due to high growth from 2001 onwards, the sample market capitalisation in the later years of the sample period tends to coincide more closely with the second market index (represented by the solid line with triangle markers).

Table 4.6 Resource consent announcements sample: Average market capitalisation comparisons

	Sample - Constant composition		Sample - Varying composition		Equal-weighted market index			
					Index 1 ≥40% days traded		Index 2 ≥60% days traded	
End of June	Average mkt cap $million	N	Average mkt cap $million	N	Average mkt cap $million	N	Average mkt cap $million	N
1992	132	10	0	0	268	69	295	62
1993	193	12	592	1	314	76	353	67
1994	188	18	361	2	339	95	375	85
1995	223	20	283	4	338	104	371	94
1996	320	21	384	7	407	105	448	95
1997	386	23	484	9	489	107	527	99
1998	297	25	410	12	377	110	406	102
1999	433	24	527	9	448	109	478	102
2000	455	24	525	11	433	110	466	102
2001	410	22	333	12	387	113	419	104
2002	469	22	343	12	396	109	439	98
2003	513	22	517	17	416	109	456	99
2004	579	24	617	22	465	114	500	106
2005	730	24	730	24	523	114	571	104
2006	813	20	813	20	516	108	566	98
2007	1150	17	1150	17	638	103	703	93

Figure 4.1 Average market capitalisations – Resource consent announcements sample and market indices ($million)



4.5.3 Control variable sources

Potentially, findings of abnormal volatility and abnormal returns may be different across the successful, unsuccessful and uncertain subsamples. To test hypotheses *H6* and *H9* for differences across these subsamples, cross-sectional regression analysis of abnormal volatility and abnormal returns is performed, controlling for firm-specific and industry-level characteristics that may otherwise affect the results. A full description of the control variables and their calculations are presented in the Chapter 5 methodology discussion. The data for the control variables comes from several different sources. Annual data for book value of total assets, book value of ordinary share equity, number of shares on issue and total liabilities is sourced from the NZX – Deep Archive Service. Market value of equity data and industry classifications are obtained from the Datastream databases. Data on number of patents held by resource consent announcers from 1995 to 2005 inclusive is compiled from information from the Intellectual Property Office of New Zealand. Aggregated patent data beyond these dates is not available, so the available data spans 11 out of the 15 years of the current study.

4.5.4 Contemporaneous media coverage data compilation

Hypothesis *H10* posits that event-day abnormal returns are positively associated with contemporaneous media coverage for successful resource announcements. This study follows Mitchell and Mulherin (1994) and Bhattacharya, Galpin, Ray and Yu (2009) by using media news releases to measure the relationship between media attention and firm-level abnormal returns. Newspaper coverage is used as a proxy for media coverage while it is recognised that information is also transmitted in other numerous ways via the internet, television, radio and other media. In New Zealand, the Dominion and the New Zealand Herald are considered to be metropolitan newspapers, with the former tending to cover more Wellington news and the latter carrying more Auckland news. Provincial newspapers such as the Press have a stronger focus on local news. Some resource consent announcements relate primarily to a particular geographic area, and hence media coverage may be restricted to the local newspapers. Other resource consents, such as energy projects, have national implications and therefore may receive wider media coverage.

To obtain information on media news coverage for the resource consent announcements sample, two archives, the Newspaper Index (NINX) and Newztext Newspapers archives are searched for all major New Zealand newspaper reports regarding each resource consent over the sample period. NINX indexes the articles from all major New Zealand newspapers from January 1993 to January 2003. Newztext Newspapers has limited newspaper article coverage from January 1995 to October 1998, and then covers all major New Zealand metropolitan and provincial newspapers from November 1998 onwards. The NINX database is searched for articles from May 1993 to January 2003, while the Newztext Newspapers database is used from January 1995 onwards. For the January 1995 to January 2003 period during which the two databases overlapped, both sources are used.

To test the relationship between resource consent announcement abnormal returns and current media news arising between the stock exchange announcement release date and the event date, a dummy variable of one is used to represent contemporaneous media coverage pertaining to an event, being zero otherwise. For those stock exchange announcements released during trading hours, the stock exchange release date is the same as the event date. However, for those stock exchange announcements released after market close, the event date is the first trading day after the stock exchange release date. Often the media publish articles over the weekend or holidays while the stock exchange is closed. Consideration of newspaper coverage is restricted to those articles published on, or subsequent to, the stock exchange announcement release date, up to and including the event date. This allows a focus on contemporaneous event-related media publicity and avoids potential endogeneity problems whereby media publicity is caused by event-induced stock price movements (Bhattacharya et al., 2009; Veldkamp, 2006). A newspaper article is defined as pertaining to a given resource consent if it includes information directly relevant to the consent and contains the words “resource consent” or “coastal permit” (a marine resource consent). Table 4.7 reveals that 31 news articles meet the above selection criteria, with events classified as successful receiving the most media attention. Some events are covered by multiple media sources during the announcement period described above, so deducting them from the total of qualifying media articles reveals that of the 90 events in the sample, 19 received contemporaneous media coverage. Predictions are limited to the successful news subsample, because the direction of reactions to the uncertain news is unknown and the size of the unsuccessful sample is too small. Accordingly, event-day abnormal returns are posited to be greater for successful resource consent announcements that

receive contemporaneous media news coverage than for those that do not receive contemporaneous media publicity. Cross-sectional regressions to further test this hypothesis are discussed in Chapter 5.

Table 4.7 Media coverage of resource consent events contemporaneous with stock exchange announcement by news classification

	All	Successful	Unsuccessful	Uncertain
Number of contemporaneous media articles	31	17	2	12
Less: Duplicated media coverage	12	5	1	6
Number of events with contemporaneous media coverage	**19**	**12**	**1**	**6**
Number of events without contemporaneous media coverage	71	32	3	36
Total	90	44	4	42

4.6 Conclusion

This chapter describes the hypotheses to be tested in this thesis to meet the two research aims concerning the capital market economic implications of resource consent information. The hypotheses are to be tested using event study methodology and cross-sectional regression analyses. The data, data sources and sampling procedures employed to test the hypotheses are presented with respect to the first research aim for the project initiation announcements study and the second research aim for the resource consent announcements study. The next chapter describes in more depth the methodologies used to test the hypotheses.

Chapter 5: Methodology

5.1 Introduction

This chapter discusses the event study and cross-sectional regression methodologies used to test the ten hypotheses proposed in this study. Sections 5.2 and 5.3 describe the methodologies used to test the hypotheses that relate to the first research aim concerning the impact of regulatory delay on capital market reactions to capital expenditure announcements. Section 5.2 describes the procedures used to construct and validate an indicator variable of expected resource consent compliance costs in connection with hypothesis *H1,* while Section 5.3 presents the methodologies employed to test hypotheses *H2* to *H3.* Sections 5.4 to 5.6 then present the methods to address the second research aim to investigate the capital market impact of resource consent announcements. Section 5.4 presents trading volume and descriptive statistics and then Sections 5.5 and 5.6 describe the methods used to test hypotheses *H4* to *H6* regarding the information content of resource consent announcements and hypotheses *H7* to *H10* with respect to their economic impact.

5.2 Measuring expected time to gain consent approval

To implement tests concerning the influence of regulatory delay on stock market reactions to project initiations, this study uses *ETCDUM* as an indicator of expected resource consent compliance costs at the time of project initiation. However, first it must be verified that *ETCDUM* is a credible measure to forecast a project's actual time to consent or abandon (*TCA*). To test the first hypothesis that the expected time for a project to gain resource consent approval is positively related to its actual time to consent or abandon, a cross-sectional regression analysis is performed. In the first instance, the natural log of the historical project-level *TCA* (*LNTCA*) for each event *i*, is regressed against the *ETCDUM* variable (excluding observations where *ETC*=0). Given the small sample size available for this regression (n=33), alternative versions of the model each add one of three control variables to the model to check that *ETCDUM*,

and not some other correlated variable, is forecasting *LNTCA*. The last model incorporates all variables as shown in equation (1):

$$LNTCA_i = \beta_0 + \beta_1 ETCDUM_i + \beta_2 LNMVA_i + \beta_3 INV/BVA_i + \beta_4 REFORMDUM_i + e_i \quad \textbf{(1)}$$

where $LNTCA_i$ is the natural log of the historical project-level time to consent or abandon described earlier in Section 4.4.3, and the control variables are defined below.

Research by the Ministry for the Environment suggests that resource consent compliance costs are significant for large and complex projects, although the point is also made that the "cost of approvals is not proportional to the business size" (Office of the Associate Minister for the Environment, 2004, p. 7). Size is controlled in two ways. First, following Chen and Ho (1997), the natural log of the market value of assets ($LNMVA_i$) is used as a proxy for firm size. Then, also following earlier studies, the relative size of the project is considered by calculating, where available, the dollar value of the investment divided by the book value of firm assets (INV/BVA_i) (Chen, 2006; Chen & Ho, 1997). Given that the Ministry research fails to reach a conclusion with regard to the relationship between compliance costs and firm or project size, in this thesis no prediction is made regarding the direction of the relationship between $LNTCA_i$ and the two size variables.

The major 2003 RMA legislative reforms discussed in Chapter 2 may have achieved their aim of reducing the costs and delays associated with obtaining and holding resource consents, and as such decreased the consent processing time. To test for the impact of the legislative reforms on $LNTCA_i$, this study uses a dummy variable $REFORMDUM_i$, that takes the value of one for announcements in the post-reform period (after December 2002) and zero otherwise. If however, the public has become more involved in the consultation process over time, then it is possible that any efficiency gains achieved through the legislation have been offset through increased consultation costs. In this case, there may not be any significant relationship between $REFORMDUM_i$ and $LNTCA_i$. Accordingly, no prediction is made regarding the sign of the $REFORMDUM_i$ coefficient.

5.3 Project initiation announcement abnormal returns

5.3.1 Empirical distributions of announcement daily returns and market model abnormal returns

The next set of tests use event study methodology to test the shareholder wealth maximisation and rational expectations theories presented in hypotheses *H2* and *H3* respectively. To test these hypotheses, the impact of new capital expenditure project announcements on stock returns is measured.

Descriptive information and distributional properties of the daily returns given alternative sample periods are presented in Panel A of Table 5.1. The proportion of zero returns ranges from 33% to 35%, reflecting days on which shares either failed to trade or closed with no change in price. Skewness coefficients are greater than zero, reflecting asymmetrical distributions skewed by positive returns. The high kurtosis coefficients indicate that the distributions are leptokurtic, being more peaked than a normal distribution.

To conduct the event study, a measure of abnormal returns is needed. Abnormal returns are calculated as the difference between observed and expected market model returns over the event window. The market model is the most commonly used return measure in event studies (Corrado & Truong, 2008), yields well-specified test statistics for as few as 50 events (S. J. Brown & Warner, 1985) and does not suffer from some of the restrictions of other models such as the constant mean return and CAPM models (MacKinlay, 1997). The market model results are tested for robustness using market-adjusted returns.

Table 5.1 Project initiation announcement return data and distributions

	Sample Period		
	-80/+10 days	-110/+10 days	-170/+10 days
Panel A. Announcement returns			
Number of events	55	55	55
Number of returns	4,968	6,561	9,708
Number of zero returns	1,626	2,252	3,345
Proportion of zero returns	0.3273	0.3432	0.3446
Mean return	0.0008	0.0007	0.0007
Median return	0.0000	0.0000	0.0000
Standard deviation	0.0185	0.0180	0.0180
Skewness	0.8987	0.6819	0.3368
Kurtosis	17.6262	16.2255	15.6532

Panel B. Market model abnormal returns

	AR1	AR2	AR1	AR2	AR1	AR2
Mean return	-0.0000	-0.0000	0.0000	0.0000	0.0000	0.0000
Median return	-0.0005	-0.0004	-0.0005	-0.0004	-0.0005	-0.0004
Standard deviation	0.0180	0.0179	0.0175	0.0175	0.0174	0.0173
Skewness	0.8828	0.9264	0.7029	0.7141	0.4933	0.4982
Kurtosis	16.5657	17.0087	14.9922	15.2610	12.4687	12.6935

AR1 = Abnormal return using market index one excluding stocks traded <40% of available days
AR2 = Abnormal return using market index two excluding stocks traded <60% of available days

Panel B of Table 5.1 presents the market model abnormal return properties and distributions for the sample over different sample periods. Market model parameters are estimated using windows of (-80,-11), (-110,-11), and (-170,-11). The results indicate that the distributions of abnormal returns for the sample are highly non-normal, although the skewness and kurtosis values are lower with the longer sample periods of 121 and 181 days. Thinly-traded security markets are particularly likely to result in high kurtosis coefficients (Corrado & Truong, 2008; Kallunki, 1997). The presence of high skewness and kurtosis coefficients violates the assumption of normality required by the standardised test statistic in parametric tests, and may lead to poorly specified tests (Campbell & Wasley, 1993; Corrado, 1989; Corrado & Truong, 2008). Furthermore, Salinger (1992) advises that problems of parameter estimation error can be minimised by choosing longer estimation periods relative to the length of the event window. A lack of historical data for several sample observations limits the market model estimation period for the longer estimation periods, so a choice of the intermediate 121 day sample period would appear to be a reasonable compromise. Robustness testing using the longer 181 day sample period is undertaken to check for potential problems caused by non-normality of data and parameter estimation error.

To calculate market model abnormal returns, AR_{it} is defined as the abnormal return for security *i* on day *t*. For each security in the sample, abnormal returns are estimated using equation (2) below as the difference between the observed security return, R_{it} for security *i* at time *t*, and the expression in brackets, being the predicted security return based on the market model. R_{mt} is the return on the market index at time *t*, and $\hat{\alpha}_i$ and $\hat{b}_i$ are parameter estimates of the market model, obtained from an ordinary least squares (OLS) regression of security returns on the returns from a market index over the estimation period.

$$AR_{it} = R_{it} - (\hat{\alpha}_i + \hat{b}_i R_{mt}) \quad \textbf{(2)}$$

Despite having deleted the most thinly-traded shares from the market index, approximately 34% of the project initiation sample returns are zero. Using daily stock market data, thinly-traded stocks are likely to display more zero and extreme value returns, causing non-normal return distributions and distorted variance estimates (Campbell & Wasley, 1993; A. R. Cowan & Sergeant, 1996). Hence problems with the specification of the market model tests can arise when stocks trade at discrete, stochastic intervals rather than continuously as assumed in the market model (Dimson, 1979; Scholes & Williams, 1977). So when trading is infrequent, as in the case of the New Zealand market, beta coefficients (and hence, predicted security returns) may be understated. Using New Zealand listed company data, Bartholdy, Fox, Gilbert, Hibbard, McNoe, Potter, Shi and Watt (1996) find that the explanatory power of the OLS equation is improved by using the Scholes-Williams (1977) beta estimator rather than the market model beta.[1] To derive the Scholes-Williams beta $\hat{\beta}_i$ as in equation (3) below, security *i* returns are regressed against market returns from the previous, current and next periods. Let $\hat{b}_i^{-1} + \hat{b}_i + \hat{b}_i^{+1}$ represent the OLS beta estimates for the previous, current and next period, and $\hat{\rho}_M$ be the sample estimate of the correlation of the security returns with the market.

$$\hat{\beta}_i = \frac{\hat{b}_i^{-1} + \hat{b}_i + \hat{b}_i^{+1}}{1 + 2\hat{\rho}_M} \quad \textbf{(3)}$$

[1] Trade-to-trade returns are an alternative approach for dealing with problems of thin trading when estimating expected returns, but are difficult to use in conjunction with the Corrado rank test, which is the primary test in this thesis (Maynes & Rumsey, 1993).

Consistent with other New Zealand stock market research (e.g. Anderson, Rose, & Cahan, 2004), the Scholes-Williams beta estimate is used in this study.

5.3.2 Non-parametric tests

As indicated in Table 4.5 above, the distributions of security returns and abnormal returns violate the parametric test assumptions of normality. Consequently in the first instance, a non-parametric test that does not make distributional assumptions is employed. Corrado and Zivney (1992) propose a variance-adjusted rank test that is free from distributional assumptions, finding the rank statistic to be better specified than either the t-test or sign test. This test includes a variance correction for prediction error to account for event-induced increases in variance which could otherwise cause test misspecification. Corrado and Zivney (1992) find that this test suffers from less misspecification than the t-test or the sign test when event date variance increases are present. Further parametric testing is also undertaken as discussed in the next section.

The following describes the use of the Corrado-Zivney variance-adjusted rank test to evaluate project initiation announcement abnormal returns. To operationalise the Corrado-Zivney rank test, the market model daily abnormal returns, AR_{it} derived from equation (2) are calculated for each event *i* over the 121 day sample period (-110,+10). Then the market model daily abnormal returns for each event *i* are standardised by dividing by the estimation period standard deviation, $S(AR_i)$ of abnormal returns for each event *i*:

$$AR'_{it} = \frac{AR_{it}}{S(AR_i)} \qquad \textbf{(4)}$$

The estimation period is defined to be from 110 days prior to the announcement to 10 days before the announcement. The 101 day estimation period standard deviation of abnormal returns for each event *i* is calculated as:

$$S(AR_i) = \sqrt{\frac{1}{101-1}\sum_{t=-110}^{-10}\left(AR_{it} - \overline{AR}_i\right)^2} \qquad \textbf{(5)}$$

where $\overline{AR}_i$ is the mean abnormal return over the estimation period. For four events for which return data are missing, estimation periods are shorter than 101 days, so the

standard deviation calculation is adjusted accordingly. The shortest estimation period used is 44 days for Wairarapa Electricity Limited.

To implement the cross-sectional variance adjustment, the standardised abnormal returns for the event window (-2, +2) are adjusted by dividing by the standard deviation of the standardised abnormal returns, $S(AR_t')$. The standard deviation of the standardised abnormal returns, $S(AR_t')$, is calculated for each day during the five day event window over all 55 events as:

$$S(AR_t') = \sqrt{\frac{1}{55-1}\sum_{i=1}^{55}\left(AR_{it}' - \overline{AR}_t\right)^2} \qquad \textbf{(6)}$$

where $\overline{AR}_t$ is the mean abnormal return over all events on day *t*. The standardised abnormal return series, X_{it}, is then defined as:

$$X_{it} = AR_{it}' \qquad \text{when } t < -2 \text{ or } t > +2, \text{ and} \qquad \textbf{(7)}$$

$$X_{it} = \frac{AR_{it}'}{S(AR_{it}')} \qquad \text{when } -2 \le t \le +2.$$

The Corrado-Zivney variance-adjusted rank test then ranks the standardised abnormal return series, X_{it}. For each event *i* over the 121 day sample period (-110 to +10), each standardised abnormal return is assigned a rank, $rank(X_{it})$ ranging from 1 to 121. To correctly account for missing returns for some securities, the fractional rank for each event standardised abnormal return is calculated as:

$$U_{it} = \frac{rank(X_{it})}{(1+M_i)} \qquad \textbf{(8)}$$

where M_i is the number of non-missing sample period returns associated with each event *i*. By construction, the security abnormal returns are transformed into a uniform distribution of ranks, with the expected value of *U* for each security *i* over all observations in the time series equal to one-half. Similarly, the expected value of *U* over all events over all observations in the time series equals one-half. Then one-half is deducted from the value of *U* for each event *i* for every day of the sample period, so that the expected value of (U_{it}-0.5) for each event *i* on any given day *t,* is now equal to

zero. To detect departures from the expected value on any given day, an estimate of *μ(U)* is calculated by summing across all *N* events for each day *t*:

$$\mu(U) = \frac{1}{\sqrt{N}} \sum_{i=1}^{N} (U_{it} - 0.5) \quad \textbf{(9)}$$

where *N* is the number of non-missing returns in the cross-section of *N* events (55 for the full sample) on day *t*. The estimate of the mean rank, *μ(U)* for event day 0 is calculated as:

$$\mu(U) = \frac{1}{\sqrt{55}} \sum_{i=1}^{55} (U_{i0} - 0.5) \quad \textbf{(10)}$$

The standard deviation, *S(U)*, is calculated over the entire 121 day sample period as:

$$S(U) = \sqrt{\frac{1}{121} \sum_{t=-110}^{+10} \left(\frac{1}{\sqrt{N}} \sum_{i=1}^{N_t} (U_{it} - 0.5) \right)^2} \quad \textbf{(11)}$$

where *N* is defined as above. The test-statistic, T_{CZ}, is calculated as:

$$T_{CZ} = \frac{\mu(U)}{S(U)} \quad \textbf{(12)}$$

For hypotheses *H2* and *H3*, a two-tail test is used to evaluate the probability that the two-day (0,+1) or three-day (0,+2) cumulative ranked abnormal returns are significantly different from zero. For hypothesis *H2* (shareholder wealth maximisation), cumulative ranked abnormal returns are predicted to be greater than zero, while for hypothesis *H3* (rational expectations), cumulative ranked abnormal returns are predicted to be equal to zero. Following Steiner and Heinke (2001) and similar to Bhattacharya, Daouk, Jorgenson and Kehr (2000), the estimates of the mean rank, *μ(U)* and standard deviation *S(U)*, for an event window from days *k* to *m* are calculated as:

$$\mu(U) = \frac{1}{\sqrt{N}} \sum_{i=1}^{N} \sum_{t=k}^{m} (U_{it} - 0.5) \quad \textbf{(13)}$$

$$S(U) = \sqrt{\frac{m-k+1}{121}\sum_{t=-110}^{+10}\left(\frac{1}{\sqrt{N}}\sum_{i=1}^{N_t}(U_{it}-0.5)\right)^2} \quad \textbf{(14)}$$

where *(m-k+1)* = number of days in event window.

For the purpose of the Corrado rank test, the calculation of the cumulative ranked abnormal return for any event window involves summing the daily ranked abnormal returns over the days of the window. The standard deviation for any event window is calculated by taking the square root of the daily variance of ranked abnormal returns over the entire sample period multiplied by the number of days in the event window.

H2a and *H3a* consider the alternative predictions of the shareholder wealth maximisation and rational expectations hypotheses regarding the impact on project announcement abnormal returns of consent compliance costs as proxied by the *ETCDUM* variable. To implement the hypothesis tests, the project initiations sample is partitioned at the median *ETC* of 11.2 months, resulting in one group with a short *ETC* and another group with a long *ETC*. In the first instance, each of the two groups' abnormal returns are analysed separately using the Corrado-Zivney variance-adjusted rank test. Then the non-parametric, two-sample Wilcoxon Z-test is used to perform an asymptotic test for differences in the two groups' standardised abnormal returns AR'_{it}, from equation (4) above. Higgins and Peterson (1998) reports that the Wilcoxon statistic possesses superior power using standardised abnormal returns as opposed to non-standardised abnormal returns. To calculate the two-sample Wilcoxon Z-test, the sample observations are ranked in ascending order, and then for each group, the ranks are summed across all observations in the group. The Wilcoxon standardised test statistic, Z, is calculated as:

$$Z = \frac{S - E_0(S)}{\sqrt{Var_0(S)}} \quad \textbf{(15)}$$

where *S* is the sum of the ranks in the smaller group, $E_0(S)$ is the expected sum of the ranks in the smaller group under the null hypothesis of no difference between the groups, and $Var_0(S)$ is the variance of *S* under the null hypothesis (SAS Institute Inc., 2004). For the purpose of testing alternative event windows using the Wilcoxon Z-statistic the standardised cumulative abnormal returns are evaluated, and are calculated as shown below:

$$CAR_{i,t} = \sum_{t=k}^{m} AR_{it} \quad \textbf{(16)}$$

$$SCAR_{i,t} = \frac{CAR_{it}}{S(CAR_i)} \quad \textbf{(17)}$$

$$S(CAR_i) = \sqrt{\frac{m-k+1}{101-1} \sum_{t=-110}^{-10} \left(AR_{it} - \overline{AR}_i\right)^2} \quad \textbf{(18)}$$

where *(m-k+1)* = number of days in event window.

A comparison of the event-window abnormal returns for the two *ETC* subsamples provides insights into the market valuation of the expected net benefits or net costs attributable to resource consent compliance for new projects. A finding that event-window abnormal returns are greater for projects in the long *ETC* subsample than those in the short *ETC* subsample would imply that projects with long consent-processing times create some sort of strategic advantage for the firm. In such a case, the expected strategic benefits must be greater than the expected compliance costs. This is consistent with the shareholder wealth maximisation hypothesis. In contrast, a finding of no difference between the short and long *ETC* groups would suggest that the compliance costs generate neither a net advantage nor disadvantage, consistent with the rational expectations hypothesis. Further testing of hypotheses *H2a* and *H3a* using cross-sectional regression is discussed later in this chapter.

5.3.3 Event study robustness tests

Three other well-documented tests are employed to test the robustness of the Corrado-Zivney variance-adjusted rank test results for *H2, H2a, H3* and *H3a.* These are the Patell (1976) standardised abnormal return test (T_{PATELL}), the Boehmer, Musumeci and Poulsen (1991) standardised cross-sectional test (T_{BMP}), and the Corrado (1989) rank test ($T_{CORRADO}$). The former two tests are parametric approaches, whereas the Corrado (1989) rank test is non-parametric. The Patell (1976) test assumes cross-sectional independence of abnormal returns and no event-induced change in cross-sectional variance of event-window abnormal returns. Boehmer, Musumeci and Poulsen (1991) present a variation of the Patell T-test that adjusts for shifts in the variance of event-

window abnormal returns through a cross-sectional variance correction. The Corrado (1989) rank test is the non-variance-adjusted version of the Corrado-Zivney (1992) variance-adjusted rank test. The t-statistics for these tests are presented in Appendix 5.

The robustness of the event study results is tested by conducting supplementary analysis using the alternate market index, market-adjusted returns, and a longer estimation period (-170, -10).

5.3.4 Cross-sectional regression analysis of cumulative abnormal returns

Hypotheses *H2a* and *H3a* make different predictions with respect to the impact of expected resource consent compliance costs on project initiation announcement abnormal returns. In order to gather further evidence regarding these hypotheses and to consider other possible firm, industry or environmental variables that may influence the results, cross-sectional regression tests are conducted. The two-day (0,+1) and three-day (0,+2) cumulative abnormal returns for each event *i,* CAR_i, are regressed against the $ETCDUM_i$ indicator variable and several control variables using ordinary least squares regression. Parametric testing is appropriate because the distributions of project announcement CAR_i, conform moderately well to the assumption of normality.

Several variants of the following cross-sectional regression model are estimated:

$$CAR_i = \beta_0 + \beta_1 ETCDUM_i + \beta_2 LNMVA_i + \beta_3 INV/BVA_i + \beta_4 RCDUM_i + \beta_5 DISCLOSDUM_i + e_i \quad \textbf{(19)}$$

where CAR_i *and* $ETCDUM_i$ are described above, and the control variables are defined below. Initially, $ETCDUM_i$ is the sole independent variable in the regression equation, and then the model is rerun to allow for additional control variables.

The differential information hypothesis suggests that the relatively greater attention of the media to large firms lessens the surprise element of large firm announcements, such that there is a negative relationship between event-period abnormal returns and firm size (Atiase, 1985). Alternatively, environmental regulation has been suggested to lead to economies of scale that relatively advantage large firms (e.g. Kohn, 1988). The results of studies of capital expenditure announcements tend to be consistent with the

differential information hypothesis (e.g. Chen, 2006; Chen & Ho, 1997; E. Jones et al., 2004). Accordingly, this study follows Chen and Ho (1997) by measuring firm size as the natural log of the market value of firm assets ($LNMVA_i$), which is expected to be negatively related to the share price reaction.

If capital expenditure projects affect shareholder wealth, then relative project size may also be important (Chen, 2006). Consistent with Chen (2006) and Chen and Ho (1997), in this study project size is measured as the dollar value of the investment divided by the book value of assets (INV/BVA_i), and is predicted to be positively related to event-window abnormal returns.

All the projects in the sample require (or already hold) resource consent approval in order to go ahead, however, only two-thirds of the announcements make explicit mention of the consent. Investors can be expected to be sufficiently aware of New Zealand laws to understand that consent is required for major projects, however, it is possible that the additional information transmitted in announcements that discuss resource consents is valued by the market. Accordingly, the model includes a dummy variable, $RCDUM_i$ equal to one when resource consent information is explicitly disclosed in the project initiation announcement, and zero otherwise. If the resource consent disclosure is informative, then there will be a positive relationship between $RCDUM_i$ and announcement abnormal returns.

For 24 of the 55 sample announcements, the possibility of the project is conjectured (usually through the media) prior to the project initiation announcement. For the remaining 31 announcements, no prior project information is found from searching the stock exchange and media databases. The prior dissemination of information may reduce informational frictions if the surprise element of a subsequent announcement is diminished, thereby reducing the follow-on stock price reaction (Blacconiere & Patten, 1994; Palepu, 1986). Alternatively, the positive feedback theory implies that speculative news and stock price increases attract investor attention, thereby generating positive investor sentiment which in turn drives further stock demand and further price increases (Shiller, 2003). Accordingly, to test the influence of investors' anticipation of the project initiation announcements, this study uses a dummy variable $DISCLOSDUM_i$ which equals one if there are no prior disclosures, and zero otherwise. No prediction for the direction of the coefficient on this variable is proposed due to the contrasting possibilities suggested by the literature.

In supplemental analysis, the effect of adding other control variables to the model are also tested. These additional variables are described below.

The December 2002 New Zealand ratification of the Kyoto Protocol and changes to the resource consent process pursuant to the Resource Management Amendment Act 2003 (No.2) may have contributed to a redistribution of wealth and/or decreased RMA compliance costs, however, the potentially offsetting influences make it difficult to predict a net direction for any impact on abnormal returns. Accordingly, added to the model is a reform dummy control variable, $REFORMDUM_i$, that takes the value of one for post-reform announcements and zero otherwise. No predictions are made on the direction of any relationship with abnormal returns.

Synergy or risk-sharing benefits associated with capital expenditures pursued through joint venture arrangements may result in positive market sentiment (Burton, 2005; E. Jones et al., 2004). A dummy variable, $JVDUM_i$, is defined to take a value of 1 for announcements associated with joint venture arrangements, and zero otherwise. It is expected that the $JVDUM_i$ coefficient will be positive if the market values joint venture arrangements more highly than single-firm ventures.

The market-to-book value of assets ratio, MB_i for event i is used to proxy growth opportunities. Some studies of capital expenditure announcements have found a relationship between growth opportunity proxies and abnormal returns (e.g. Brailsford & Yeoh, 2004; Chen, 2006). These findings imply that firms with greater growth options tend to invest in positive net present value investments, so MB_i is expected to be positively related to abnormal returns. Following previous studies, MB_i is measured as the ratio of the market value of assets (market value of ordinary share equity plus the book value of total assets minus the book value of ordinary share equity) to the book value of total assets (e.g. Chen & Ho, 1997; Kang & Stulz, 1996; Thomas, 2002). Following Chen and Ho (1997) and Kim, Lyn, Park and Zychowicz (2005) the MB_i variable is calculated as an average of the *MB* at the three fiscal year-ends immediately prior to the announcement to control for possible shifts in *MB* over time. When fewer than three years of market value data is available, the average *MB* is calculated over the latest available *MB* for year-ends prior to the announcement.

Following Chen (2006), to control for the possible influence of financial leverage, the announcers' debt ratio (LEV_i) at the fiscal year-end immediately prior to the announcement, is included in the model. Szewczyk, Tsetsekos and Zantout (1996) and

Chen and Ho (1997) find a positive relationship between the debt ratio and abnormal returns for firms announcing capital expenditures, and they find leverage to be a more significant measure of free cash flow than other measures. Hence the coefficient of the leverage variable is expected to be positive if the commitment to pay higher levels of debt signals less wasteful use of free cash flow.

Energy generation projects comprise 15 of the 55 sample announcements. To control for the possible opportunity for energy generators to earn market rents (Commerce Commission, 2009), a dummy variable for energy generation projects, $ENERGDUM_i$ is included in the supplementary regression tests.

The magnitude of investors' reactions to news announcements may be positively related to media coverage (Klibanoff et al., 1998; Pritamani & Singal, 2001). The model for this study adds a dummy variable, $MEDIADUM_i$, which equals one if the announcement is reported in the media on the announcement day, and zero otherwise. The $MEDIADUM_i$ coefficient is expected to be positive if the presence of media coverage is positively associated with project initiation announcement abnormal returns.

Lastly, event study mean abnormal returns on small stock exchanges may be lower for thickly-traded shares relative to thinly-traded shares (Bartholdy, Olson, & Peare, 2007). Following Anderson, Rose and Cahan (2006), the liquidity variable VOL_i, calculated as the estimation period (-110 to -10) average daily trading volume divided by total shares on issue prior to the announcement, is added to the model to control for potential liquidity effects of thin-trading. The coefficient for VOL_i is expected to be negative if thickly-traded shares earn lower abnormal returns.

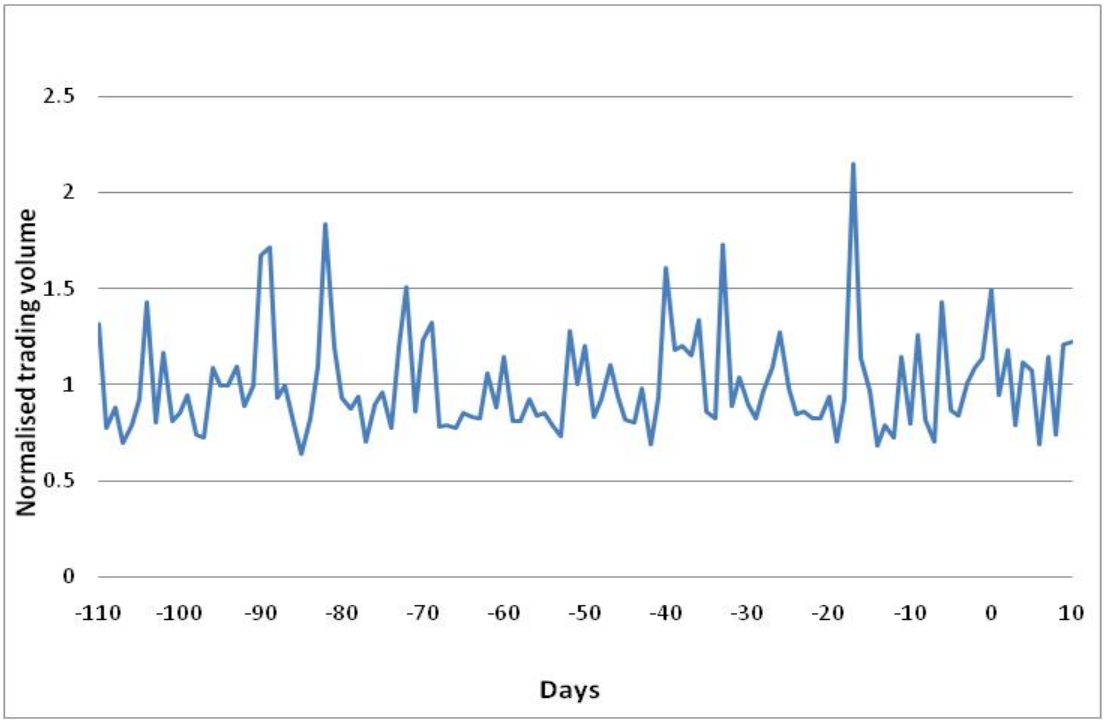
5.4 The information content and economic impact of resource consent announcements

5.4.1 Trading volume

Prior to testing formal hypotheses regarding the information content of resource consent announcements, an exploratory investigation of abnormal trading volume is

undertaken below following the methodology adopted by Bhattacharya, Daouk, Jorgenson and Kehr (2000). They derive a daily normalised trading volume measure for each event that permits the comparison of firms of different size. The first step requires a measure of normal trading volume for each event, measured as the average daily trading volume (number of shares) over the 121 day sample period. Next, for each event the normalised trading volume for each day in the sample period is calculated by dividing the actual daily trading volume by the normal trading volume. Then for each day, the average normalised trading volume is calculated across all 90 events, such that the daily normalised trading volume is expected to be equal to one. Daily normalised trading volume is plotted over the 121 day sample period in Figure 5.1.

Figure 5.1 Daily average normalised volume around resource consent announcements



A large spike on or around the event day would suggest that the resource consent announcement may have affected trading activity. Average normalised trading activity on event day 0 is equal to 1.49, or 49% greater than average. However, as is evident from the graph, this trading volume is not particularly unusual. Note the large spike on day -17 is driven by the December 23, 2004 share purchase of a 19.9% stake in Northland Port Corporation by Ports of Auckland. This is not related to any resource consent announcement. Given the lack of evidence concerning unusual trading activity associated with resource consent announcements, no further empirical testing is

undertaken with respect to trading volume. However, some discussion of trading activity will be included in later chapters of the thesis in order to add context to the other findings.

5.4.2 Empirical distributions of announcement daily returns and market model abnormal returns

Event study methodology is used to test hypotheses *H4* to *H10* in connection with the second research aim to investigate the capital market impact of resource consent announcements. Descriptive information and distributional properties of the resource consent announcements sample daily returns given alternative sample periods are presented in Panel A of Table 5.2. The proportion of zero returns is about 35%, reflecting days on which shares either failed to trade or closed with no change in price. Skewness coefficients are well above zero, reflecting asymmetrical distributions skewed by highly positive returns. As revealed by the high kurtosis coefficients, the distributions are leptokurtic, being more peaked than a normal distribution.

Table 5.2 Resource consent announcement return data and distributions

	Sample Period		
	-80/+10 days	-110/+10 days	-260/+20 days
Panel A. Announcement returns			
Number of events	90	90	90
Number of returns	8,172	10,807	24,489
Number of zero returns	2,854	3,815	8,652
Proportion of zero returns	0.3492	0.3530	0.3533
Median return	0.0000	0.0000	0.0000
Mean return	0.0014	0.0013	0.0012
Standard deviation	0.0274	0.0272	0.0300
Skewness	3.3520	2.7509	4.7577
Kurtosis	80.9140	82.5454	144.5008

Panel B. Market model abnormal returns						
	AR1	AR2	AR1	AR2	AR1	AR2
Mean return	-0.0000	-0.0001	0.0000	0.0000	0.0000	0.0000
Median return	-0.0007	-0.0007	-0.0007	-0.0007	-0.0007	-0.0008
Standard deviation	0.0269	0.0274	0.0267	0.0269	0.0295	0.0297
Skewness	2.9476	3.2997	2.3584	2.4990	4.3638	4.5293
Kurtosis	70.2097	78.0407	78.4175	82.8304	142.7829	145.0850

AR1 = Abnormal return using market index one excluding stocks traded <40% of available days
AR2 = Abnormal return using market index two excluding stocks traded <60% of available days

Market model abnormal returns using the Scholes-Williams beta are calculated as described previously in Section 5.3.1. Panel B of Table 5.2 presents the market model

abnormal return properties and distributions for the sample over different sample periods. Even more so than the project announcements sample, the distributions of abnormal returns for the resource consent announcements sample are highly non-normal, although the skewness and kurtosis values are generally less with the shorter sample periods of 91 and 121 days.[2] This suggests that the shorter sample periods will be less prone to problems caused by non-normality. However, parameter estimation error can be a problem with short estimation periods (Salinger, 1992). A choice of the intermediate 121 day sample period would appear to be a reasonable compromise to minimise potential problems caused by non-normality of data and parameter estimation error.

5.5 The information content of resource consent announcements

Some econometric challenges are present for testing hypotheses *H4* to *H6* regarding the informativeness of resource consent announcements. In conventional event study methodology, abnormal returns for each event day are averaged over the sample to compute daily average abnormal returns. However, the events reported upon in this study could be interpreted as good, bad or neutral. Given that good and bad news announcements could potentially produce offsetting results, pooling excess returns across the entire sample of resource consent announcers would not be very illuminating. However, given that the full sample yields a total of 90 events, partitioning of the sample will reduce the power of tests to find statistically significant results. Consequently, following the methodology employed in Bhattacharya, Daouk, Jorgenson and Kehr (2000), the absolute values of abnormal returns are pooled over the entire sample to test the three hypotheses concerning the information content of resource consent announcements. Note the absolute value of abnormal returns represents a measure of abnormal return volatility. Conventional parametric t-tests cannot be used to test these hypotheses as the non-normality of distributions of security returns and absolute abnormal returns violate parametric test assumptions. Campbell and Wasley (1993) recommend the use of the Corrado rank test when the assumptions of parametric tests may be violated. These violations include non-

[2] The distributions of market-adjusted returns (untabulated) are similar to those of the market model abnormal returns, although skewness and kurtosis values are slightly higher for the market-adjusted returns, indicating more severe deviations from normality.

normality of abnormal returns, cross-sectional dependence, thin trading, clustered event dates, event-induced increases in the variance of event-day abnormal returns and serial correlation of market model residuals. Accordingly, for hypotheses *H4* to *H6*, the Corrado rank test (Corrado & Zivney, 1992) is used to evaluate security absolute abnormal return reactions to resource consent disclosures.

5.5.1 Non-parametric tests

The Corrado rank test is a non-variance-adjusted version of the Corrado-Zivney (1992) variance-adjusted rank test described earlier in Section 5.3.2. Rather than ranking the standardised abnormal return series, this study ranks the absolute values of the market model daily abnormal return series. So for each event *i* over the 121 day sample period (-110,+10), the absolute values of the market model daily abnormal returns, AAR_{it} are each assigned a rank, $rank(K_{it})$ ranging from rank 1 for the smallest absolute abnormal return to rank 121 for the largest. The procedures described in Section 5.3.2 from equations (8) to (12) are followed. To detect departures from the expected value on any given day, an estimate of $\mu(U)$ is calculated using equation (9) by summing across all *N* events (90 for the full sample) for each day *t*. The estimate of the mean rank, $\mu(U)$ for event day 0 is calculated as:

$$\mu(U) = \frac{1}{\sqrt{90}} \sum_{i=1}^{90} (U_{i0} - 0.5) \qquad \textbf{(20)}$$

As in Section 5.3.2, the standard deviation, $S(U)$, is calculated over the entire 121 day sample period as:

$$S(U) = \sqrt{\frac{1}{121} \sum_{t=-110}^{+10} \left(\frac{1}{\sqrt{N}} \sum_{i=1}^{N_t} (U_{it} - 0.5) \right)^2} \qquad \textbf{(21)}$$

where *N* is defined as above. The test-statistic, $T_{CORRADO}$, is calculated as:

$$T_{CORRADO} = \frac{\mu(U)}{S(U)} \qquad \textbf{(22)}$$

For hypothesis *H4*, a one-tail test is used to evaluate the probability that the day 0 absolute abnormal return is significantly greater than zero. The null hypothesis is that the event-day ranked absolute abnormal return is less than or equal to zero. Note a two-tailed test is not required, as there is no interest in the probability that the day 0 volatility is less than that during the sample period. Rather, the information content of resource consent announcements is to be assessed by looking for evidence of excess volatility around the time of the announcement.

Hypothesis *H5* is concerned with testing for changes in informational efficiency over the time of the study that may affect the hypothesis *H4* results. This involves comparing the event-day absolute abnormal returns of announcers before and after the December 2002 implementation of the enhanced NZX disclosure regime and New Zealand ratification of the Kyoto Protocol. The sample is partitioned into two groups at December 2002 representing the pre-reform and post-reform periods, and the ranked absolute abnormal returns around the announcement dates are analysed separately using the Corrado rank test as described for hypothesis *H4*. Then the non-parametric, two-sample Wilcoxon Z-test as described in Section 5.3.2 is used to perform an asymptotic test for differences in the two groups' absolute abnormal returns. Lower absolute returns around the announcement date in the post-reform period would indicate that information has already been impounded into the stock returns prior to the announcement, implying improved informational efficiency (Huang et al., 2008). A one-tailed test is used to test hypothesis *H5* that event-day absolute abnormal returns of resource consent announcements in the post-reform period are lower than those in the pre-reform period.

Hypothesis *H6* considers whether the magnitude of event-induced volatility may depend upon the degree of precision of an event. For this study, resource consent announcements that signal success or failure in the consent process are argued to be more precise than those that lack a clear success/fail message or those that report on different outcomes for multiple consents. Accordingly, resource consent announcements that are classified as successful or unsuccessful are expected to display lower event-induced volatility than those announcements that are categorised as uncertain. To test hypothesis *H6*, for each of the successful, unsuccessful and uncertain news subsamples, the ranked absolute abnormal returns around the event dates are analysed using the Corrado rank test as described above. The two-sample Wilcoxon Z-test is then used to test for differences in the median absolute abnormal

returns between the groups. Further testing of this hypothesis using cross-sectional regression is discussed later.

Although no specific hypotheses are proposed, the ranked absolute abnormal returns for the two days before and after the event date are also tested in conjunction with hypotheses *H4* to *H6* in order to shed light on the information diffusion process surrounding resource consent announcements. This allows the cumulative ranked absolute abnormal returns *(CAAR)* to be calculated over different event windows in order to investigate the persistence of any reaction. The estimates of the mean rank, *μ(U)* (or *CAAR*) and standard deviation *S(U)*, for an event window from days *k* to *m* are calculated as:

$$\mu(U) = \frac{1}{\sqrt{N}} \sum_{i=1}^{N} \sum_{t=k}^{m} \left(U_{it} - 0.5\right) \quad \textbf{(23)}$$

$$S(U) = \sqrt{\frac{m-k+1}{121} \sum_{t=-110}^{+10} \left(\frac{1}{\sqrt{N}} \sum_{i=1}^{N_t} \left(U_{it} - 0.5\right) \right)^2} \quad \textbf{(24)}$$

where *(m-k+1)* = number of days in event window.

As in equation (22) above, the test statistic for testing the significance of the mean volatility using the Corrado rank test involves dividing the mean from equation (23) by the standard deviation in equation (24).

For the purpose of testing alternative event windows using the Wilcoxon Z-statistic, the calculation of absolute cumulative abnormal returns follows that commonly used in volatility studies whereby the abnormal returns from equation (2) for each event *i* are first cumulated over the days of the event window starting with the first day, *t=k* to the last day *t=m*, of the accumulation window, and then the absolute value is computed (e.g. Bailey, Karolyi, & Salva, 2006; Huang et al., 2008):

$$ACAR_{i,t} = \left| \sum_{t=k}^{m} AR_{it} \right| \quad \textbf{(25)}$$

5.5.2 Event study robustness tests

The robustness of the event study daily results is tested by conducting supplementary analyses using the alternate market index, market-adjusted returns and a longer estimation period (-170, -10).

Additional tests check the robustness of subsample analyses. For testing hypothesis *H5*, the sample is initially partitioned into two groups at December 2002 representing the pre-reform and post-reform periods, This division partially allows for potential effects of a further RMA amendment enacted in August 2003, because 38 of the 45 pre-August 2003 announcements arose prior to December 2002. The effects of alternatively dividing the sample at August 2003 are also reported. Also presented are the effects of using the alternate market index for the reform and news classification subsamples for hypotheses *H5* and *H6*, respectively.

5.5.3 Cross-sectional regression analysis of absolute cumulative abnormal returns

Hypotheses *H5* and *H6* suggest that the regulatory reforms and news classification types may affect event-day return volatility differently. In order to gain further evidence regarding these hypotheses and to consider other possible firm, industry or environmental variables that may influence event window volatility, cross-sectional regression tests are conducted. The absolute value of equation (2) day 0 abnormal returns for each event *i,* AAR_i, are regressed against the news classification variables, the reform variable and several control variables. To check the persistence of the results, further tests follow the convention of using the absolute value of the cumulative abnormal returns for event *i,* $ACAR_i$, from equation (25) over different event windows as the dependent variable (e.g. Bailey et al., 2006; Huang et al., 2008).

The non-normality of the AAR_i and $ACAR_i$ distributions violates the assumption of normality required by parametric ordinary and generalised least squares regression. To overcome this problem, a generalised least squares rank regression is used (Conover & Iman, 1981). Other financial research studies that use rank regression include Bamber and Cheon (1995), Guo, Lev and Zhou (2004) and Pacini, Hillison, Marlett and Burgess (2005).

To operationalise the rank regression, the following is applied separately to each quantitative independent and dependent variable. Observed values for the variable are first sorted in descending order over the entire sample and then assigned a rank. The ranking transforms the set of values for a given variable to a normal, linear distribution by replacing each value by its relative rank, thus reducing the sensitivity of the results to outliers (Cheng, Hopwood, & McKeown, 1992). As described in equation (8) above, ranks are standardised by dividing each rank by one plus the number of non-missing observations. Conventional parametric generalised least squares regression is then applied to the ranked variables.

Several versions of the following cross-sectional rank regression model are estimated:

$$AAR_i = \beta_0 + \beta_1 SCSDUM_i + \beta_2 UNSCSDUM_i + \beta_3 REFORMDUM_i + \beta_4 MB_i + \beta_5 LEV_i + \beta_6 MVE_i + \beta_7 MEDIADUM_i + \beta_8 PATDUM_i + \beta_9 DISCLOSDUM_i + \sum_{j=1}^{J-1} B_{10j} INDDUM_{ji} + e_i \quad \textbf{(26)}$$

where AAR_i is described above, and the independent variables are defined below. Initially, only the main independent variables of interest are included in the regression equation, being the news classification and reform variables. The model is then rerun to allow for additional control variables. For testing over a wider window, the values for the variable $ACAR_i$ are substituted for the day 0 AAR_i. When the wider (-2,+2) window for $ACAR_i$ is tested, an additional dummy variable $CONTAMDUM_i$ is added to control for announcements contaminated by other confounding events on days -2 or +2. This is necessary as the paucity of the data restricted the sample selection process so that only announcements with confounding events on days -1, 0 and +1 were excluded.

To test for the impact of the news classification on volatility, news classification dummy variables relating to successful (*SCSDUM)*, unsuccessful (*UNSCSDUM)* and uncertain (*UNCDUM)* resource consent announcements are defined to take the value of 1 when they apply, and 0 otherwise. By including the $SCSDUM_i$ and $UNSCSDUM_i$ variables and omitting the $UNCDUM_i$ variable in the regression equation, the differential impact of successful and unsuccessful announcements relative to uncertain announcements is tested. It is expected that the $SCSDUM_i$ and $UNSCSDUM_i$ coefficients will be negative if, as hypothesised in *H6*, more precise signals reduce the disagreement among investors. To test for the differential impact of successful and uncertain announcements relative to unsuccessful announcements, the regression is also run substituting

$UNCDUM_i$ in place of $UNSCSDUM_i$ in the regression equation. Following Bomfim (2003) and Engle and Ng (1993), positive and negative shocks may result in different magnitudes of reaction, so the $SCSDUM_i$ coefficient is expected to be negative if successful announcements decrease the volatility of returns relative to unsuccessful announcements.

The stock exchange and legislative reforms in 2002 and 2003 are hypothesised to have improved information flows and therefore reduced the return volatility in the post-reform period (Huang et al., 2008). Consistent with the cross-sectional regression of $LNTCA_i$ in equation (1), a dummy variable $REFORMDUM_i$ is constructed that takes the value of one for announcements in the post-reform period and zero otherwise. A negative relationship is predicted between $REFORMDUM_i$ and event-day volatility.

The other independent variables in equation (26) allow for the possibility that other firm and industry factors may influence absolute abnormal returns. In this study, the market-to-book value of assets ratio, MB_i for event i is used as a proxy for growth opportunities. If growth opportunities affect information asymmetry between managers and investors, then firms with greater investment opportunities may display higher volatility (Huang et al., 2008). The measurement of MB_i is described earlier in Section 5.3.4. For three events that had recently listed on the stock exchange prior to the announcement, the market value of ordinary share equity is calculated at the first month-end after listing (at least five months before the announcement), and the book value measures are obtained from pre-listing fiscal year-end data. For one overseas issuer, Oceana Gold Limited, no financial statement data is available. A positive relationship is expected between MB_i and absolute abnormal returns.

Following Huang, Marsden and Poskitt (2008), the debt ratio is used to proxy for default risk, with LEV_i defined as the ratio of total liabilities to total assets. If investors demand a premium to compensate for default risk, then a positive relationship is expected between LEV_i and absolute abnormal returns.

The differential information hypothesis suggests that if the media and security analysts devote more attention to large firms rather than small firms, then the magnitude of investors' reactions to announcements of large firms may be smaller (Atiase, 1985). Following prior volatility research, the firm size variable, MVE_i, is measured as the market value of a firm's ordinary equity at the fiscal year end prior to the announcement (Bailey, Li, Mao, & Zhong, 2003). Given that information asymmetry is likely to be less

severe for large firms, a negative relationship is expected between MVE_i, and absolute abnormal returns.

In contrast to the differential information hypothesis, some evidence suggests that media coverage of firms may be positively related to firm-specific volatility (Dowen, 1995; Klibanoff et al., 1998; Mitchell & Mulherin, 1994). Regression equation (26) uses a dummy variable $MEDIADUM_i$, which equals one for the presence of contemporaneous media coverage of the announcement event, and zero otherwise. A positive relationship is expected between $MEDIADUM_i$ and event-day absolute abnormal returns.

Investors may have more difficulty assessing the implications of events that are accompanied by high uncertainty, such as innovation news in high technology firms (Liu, 2006; X. F. Zhang, 2006). Similarly, the results in this study may be driven by high uncertainty for firms engaging in research and development activities. Over the period of this study, New Zealand firms were not required to divulge research and development costs in their financial accounts, so innovative activity is controlled using patent data. A dummy variable, $PATDUM_i$, is defined to be equal to one if a patent application was filed at the Intellectual Property Office of New Zealand by the firm in any year from 1995 up to and including the event year, and zero otherwise. A positive relationship between $PATDUM_i$ and event-day absolute abnormal returns is predicted if information asymmetry is greater for firms engaged in patent activity.

Companies may issue several resource consent announcements over the course of the approval period for a particular project. Earlier research evidence suggests that previous disclosures could either attenuate the effect of a subsequent announcement through reductions in information asymmetry (Blacconiere & Patten, 1994; Palepu, 1986), or intensify it due to investor sentiment (Shiller, 2003). Accordingly, to test for the influence of investors' anticipation on subsequent resource consent announcements, a dummy variable $DISCLOSDUM_i$, is used which equals one if there are no prior resource consent disclosures relating to a specific resource consent by a given firm, and zero otherwise. Given that the literature implies different potential impacts of prior disclosures, no prediction is made for the direction of the relationship between prior disclosures and volatility.

Finally, several industry control dummies that may have an impact on return volatility are included in the model. *UTILS, OILGS, BMATR, INDUS* and *HLTHCR* denote firms

in the utilities, oil and gas, basic materials, industrials and healthcare industries, respectively, while *FINCON* combines firms in the financial and consumer goods sectors. The consumer goods sector is too small to test in isolation as it contains only two events from the retail company, The Warehouse Limited. Given that the financial services sector is heavily dominated by companies with shopping mall property investments, the fortunes of this sector and The Warehouse Limited would be reasonably aligned. The industry dummy variables test the volatility impact of each industry relative to the healthcare industry.

5.6 The economic impact of resource consent announcements

5.6.1 Non-parametric tests

Hypotheses *H7* to *H10* seek to test the impact of resource consent announcements on stock returns, and in doing so, shed light on the direction of changes in the market valuation of projects. The return data from the resource consent announcement sample is partitioned as for hypothesis *H6* to form successful, unsuccessful and uncertain announcement subsamples. Abnormal returns for each subsample are then calculated using the market model with the Scholes-Williams (1977) beta as presented earlier in equations (2) and (3) above. The Corrado-Zivney (1992) variance-adjusted rank test described earlier in Section 5.3.2 is used to evaluate the subsample abnormal returns.

Hypotheses *H7* and *H8* investigate the economic implications of resource consent announcements by evaluating the event-day abnormal returns for each of the successful and unsuccessful subsamples. Event-day abnormal returns are expected to be greater than zero for the successful group and lower than zero for the unsuccessful group. No prediction is made for the sign of any abnormal returns for the uncertain group. The standardised abnormal returns X_{it} and cumulative standardised abnormal returns are also tested for up to two days around each event for hypotheses *H7* and *H8* in order to gain insights into the price adjustment process. However, given the uncertainties around the degree of anticipation of events and the small sample sizes, no hypotheses are able to be formulated.

The stock exchange and legislative reforms may have some effect on resource consent announcement abnormal returns. On the one hand, the legislative reforms in particular may have reduced the regulatory compliance costs associated with the resource consent process, in which case one might expect stock prices and abnormal returns to rise in the post-reform period, particularly for the successful events. If however, the reduction in compliance costs lowers barriers to new entrants and reduces the opportunity for resource consent holders to earn economic profits, then stock prices and abnormal returns may decline in the post-reform period. Accordingly, no hypothesis is proposed for the effect of the reforms on abnormal returns of resource consent announcers, but the results from an analysis of the effects using the two-sample Wilcoxon Z-test from equation (15) will be reported.

Hypothesis *H9* predicts that event-day abnormal returns will be lower for unsuccessful resource consent announcements than for either successful or uncertain announcements. The two-sample Wilcoxon Z-test from equation (15) above is used to test for differences in the equation (4) subsample standardised abnormal returns, AR'_{it}.

Hypothesis *H10* regarding the relationship of media coverage of events with the magnitude and/or speed of price reactions to resource consent announcements is tested using the Corrado-Zivney variance-adjusted rank test and the two-sample Wilcoxon Z-test, both of which have been described earlier.

5.6.2 Event study robustness tests

The robustness of the event study daily results is tested by conducting supplementary analyses using the alternate market index, market-adjusted returns, and non-variance-adjusted ranked abnormal returns. Also presented are the effects of using the alternate market index for the news classification and contemporaneous media coverage subsamples for hypotheses *H9* and *H10*, respectively.

5.6.3 Cross-sectional regression analysis of cumulative abnormal returns

Hypotheses *H9* and *H10* consider potential differences in event-day abnormal returns depending upon the news classification and media coverage. Cross-sectional regression analysis is undertaken to determine whether firm and industry factors other

than the key variables of interest may affect abnormal returns. The day 0 abnormal returns in equation (2) for each event *i, AR_i*, are regressed against the news classification variables, the media coverage variable and several control variables. Persistence of results is tested using the equation (16) cumulative abnormal returns for event *i, CAR_i*, as the dependent variable over different event windows.

As reported earlier in Table 5.2, the sample abnormal returns distributions display particularly high skewness and kurtosis values. As this violates the normality assumption of parametric ordinary and generalised least squares regression, a generalised least squares rank regression is used as described earlier.

Several versions of the following cross-sectional rank regression model are estimated:

$$AR_i = \beta_0 + \beta_1 SCSDUM_i + \beta_2 UNSCSDUM_i + \beta_3 MEDIADUM_i + \beta_4 MB_i + \beta_5 LEV_i + \beta_6 MVE_i + \beta_7 PATDUM_i + \sum_{j=1}^{J-1} B_{8j} INDDUM_{ji} + e_i \quad \textbf{(27)}$$

where AR_i is described above, and the independent variables are defined below. Initially, only the main independent variables of interest are included in the regression equation, being the news classification and media coverage variables. The model is then retested with several control variables. For testing over a wider window, the values for the variable CAR_i are substituted for the day 0 AR_i. When the wider (-2,+2) window for CAR_i is tested, an additional dummy variable $CONTAMDUM_i$ is added to control for announcements contaminated by other confounding events on days -2 or +2.

The key independent variables to be tested in hypothesis *H9* are the news classification dummies, where $SCSDUM_i$, $UNSCSDUM_i$ and $UNCDUM_i$ are as defined earlier. Initially, $UNCDUM_i$ is omitted from the equation to test for differences in abnormal returns for successful and unsuccessful announcements relative to uncertain announcements. Successful resource consent announcements are expected to have a positive regression coefficient if success news is more highly valued than uncertain news, and unsuccessful resource consent announcements are expected to have a negative coefficient if they are viewed more negatively than uncertain news. To more explicitly test hypothesis *H9* concerning the differential impact of successful and uncertain announcements relative to unsuccessful announcements, $UNCDUM_i$ is substituted for $UNSCSDUM_i$ in the regression equation. If successful and uncertain

news are valued more positively than unsuccessful news, then the $SCSDUM_i$, and $UNCDUM_i$ coefficients are expected to be positive.

Hypothesis *H10* considers the potential relationship that current media coverage may have with abnormal returns from successful resource consent announcements. Regression equation (27) uses a dummy variable $MEDIADUM_i$, which equals one for the presence of contemporaneous media coverage of the announcement event, and zero otherwise. To consider the incremental influence of media presence on successful announcements relative to other news classification types, an interaction term, $SCSDUM_i*MEDIADUM_i$, is also tested. If the presence of concurrent media coverage is associated with increased abnormal returns for successful consent announcements, then the $SCSDUM_i*MEDIADUM_i$ coefficient is expected to be positive (Bhattacharya et al., 2009).

As discussed earlier in connection with regression equation (26), the market-to-book value of assets ratio, MB_i for event *i* is used to proxy growth opportunities, and the announcers' debt ratio (LEV_i), at the fiscal year-end immediately prior to the announcement is used to control for the possible influence of financial leverage (Chen, 2006; Chen & Ho, 1997; Szewczyk et al., 1996). If firms with greater growth options tend to invest in positive net present value investments, then MB_i is expected to be positively related to abnormal returns. The coefficient of the leverage variable is expected to be positive if the commitment to pay higher levels of debt signals less wasteful use of free cash flow.

Small firms tend to have larger risk-adjusted returns than large firms, and accordingly the market value of the announcing firm at the previous fiscal year-end (MVE_i) is included in the regression equation to control for firm size (Chen, 2006; Chen & Ho, 1997; E. Jones et al., 2004). A negative relationship is predicted between MVE_i and abnormal returns.

In a study of large Australian firms, Bosworth and Rogers (2001) find patent activity to be strongly positively related to firm market value. Similarly, patent activities may be important for explaining the stock returns of firms engaged in innovative activities, so $PATDUM_i$ is expected to be positively related to AR_i (Bastin & Hubner, 2006; Liu, 2006).

To control for the possibility that industry-specific factors are driving the results, the industry dummy variables described earlier are included to test the impact on abnormal returns of each industry relative to the healthcare industry.

Additional robustness testing considers other possible influences on the results. The effect of investors' anticipation of announcements due to pre-event, firm-specific media publicity is considered by adding a dummy variable, $PREMEDIADUM_i$, equal to 1 for firm-specific media publicity in the 14 calendar days prior to the announcement, and 0 otherwise. As discussed previously in connection with the project initiation regression equation (19), a liquidity variable VOL_i, calculated as the estimation period (-110 to -10) average daily trading volume divided by total shares on issue prior to the announcement, is also added to the model to test for potential liquidity effects of thin-trading (Anderson et al., 2006). The coefficient for VOL_i is expected to be negative if thickly-traded shares earn lower abnormal returns.

5.7 Conclusion

This chapter presents the methodologies adopted to test the hypotheses described in Chapter 4. To test the first hypothesis, cross-sectional regression analysis is used to check the credibility of a constructed expected time to consent measure. For the remaining hypotheses, event study methodology is employed. To test the shareholder wealth maximisation and rational expectations theories presented in hypotheses *H2* and *H3*, the impact of new capital expenditure project announcements on abnormal stock returns is measured. For hypotheses *H4* to *H6* regarding the information content of resource consent announcements, the effect of the announcements on abnormal return volatility is tested. Then for hypotheses *H7* to *H10*, the economic impact of resource consent announcements is investigated by testing the impact of the announcements, partitioned by news characteristics, on abnormal returns. Robustness tests and cross-sectional regression analyses are conducted to check the veracity of all event study results. In the following two chapters, the empirical results from testing the hypotheses are presented and discussed. Chapter 6 presents empirical evidence of the capital market reaction to project initiation announcements and expected resource consent compliance costs. Then in Chapter 7, the results from tests of the capital market impact of resource consent announcements are examined.

Chapter 6: Empirical results - The market reaction to project initiation announcements and expected resource consent compliance costs

6.1 Introduction

This chapter presents empirical evidence from the tests of hypotheses *H1* to *H3a* to address the first research aim of examining the impact of environmental regulatory delay on capital market reactions to capital expenditure announcements. Section 6.2 presents the cross-sectional regression tests and supporting evidence to validate a measure of expected resource consent compliance costs pertaining to hypothesis *H1*. Section 6.3 presents descriptive sample statistics, correlations and analysis of event-window abnormal returns in order to test the alternative shareholder wealth and rational expectations hypotheses posited in hypotheses *H2* and *H3*. Section 6.4 then presents further evidence with respect to hypotheses *H2a* and *H3a* regarding the role of expected resource consent compliance costs in explaining the market reaction to project initiation announcements. The last section provides a summary and conclusion for the chapter.

6.2 Expected time to gain consent approval

The first test involves the validation of a constructed measure of expected consent compliance costs (*ETCDUM*) to be used in subsequent analyses that test the effect of compliance costs on stock market reactions to project initiation announcements. Table 6.1 presents the results of the OLS regression analyses to test hypothesis *H1* that the expected time for a project to gain resource consent approval is positively related to its actual time to consent or abandon (*TCA*). To overcome the problem of heteroskedasticity of disturbance terms, the White (1980) error correction method is employed. In all models, the coefficient on the *ETCDUM* variable is positive and

strongly statistically significant at the 1% level, indicating that it is a valid predictor of the actual time to gain consent approval or abandon a project. The coefficients on the control variables of firm size (*LNMVA*), relative project size (*INV/BVA*), and reform (*REFORMDUM*) are statistically insignificant in all models.

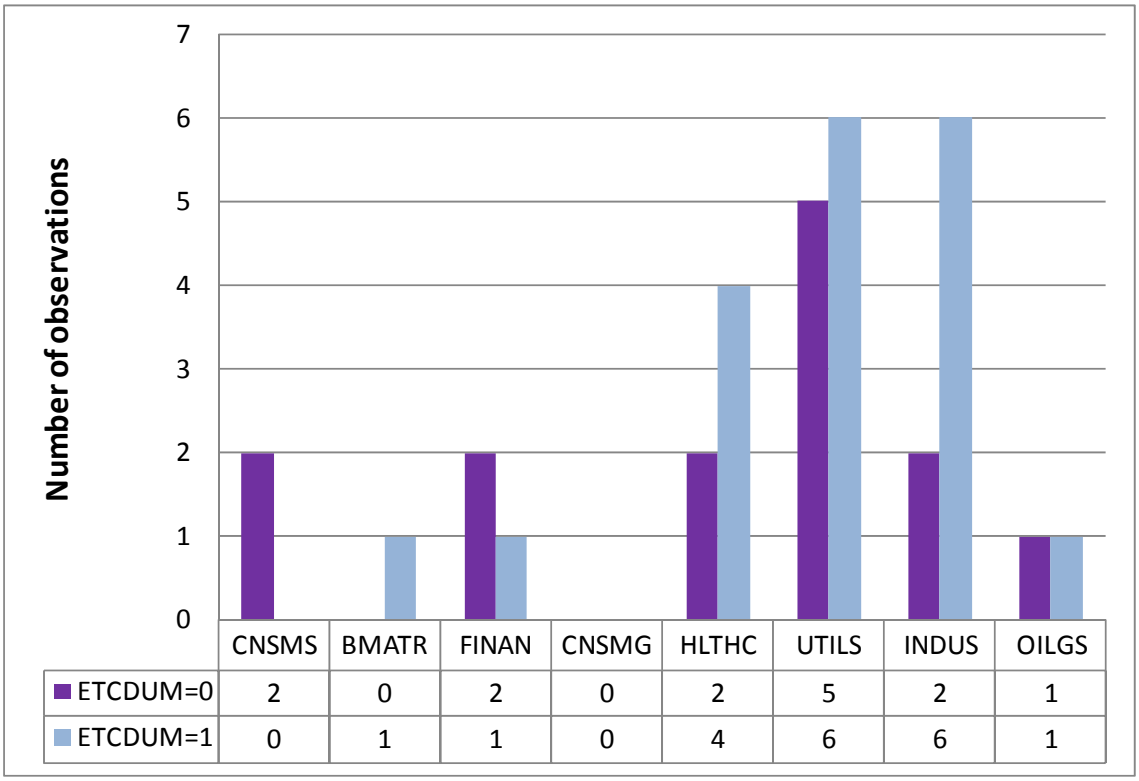
Table 6.1 Cross-sectional regression analyses of LNTCA (t-statistics)

Variable	Predicted sign	Model 1 (n=33)	Model 2 (n=33)	Model 3 (n=20)	Model 4 (n=33)	Model 5 (n=20)
Constant		2.0694 (11.82)[a]	4.4289 (2.44)[b]	2.0460 (10.30)[a]	2.1396 (11.71)[a]	3.9057 (1.90)[c]
ETCDUM variable (excluding ETC=0)	+	0.7238 (2.72)[a]	0.7595 (2.88)[a]	0.8618 (2.78)[a]	0.7127 (2.79)[a]	1.0105 (3.16)[a]
LNMVA	n/a		-0.1176 (-1.30)			-0.0990 (-1.02)
INV/BVA	n/a			1.1072 (0.88)		0.7640 (0.47)
REFORMDUM	n/a				-0.1404 (-0.53)	0.3513 (1.10)
Adjusted R^2		0.144	0.149	0.329	0.122	0.309

[a, b] and [c] denote statistical significance at the 1%, 5% and 10% levels, respectively, using two-tailed tests

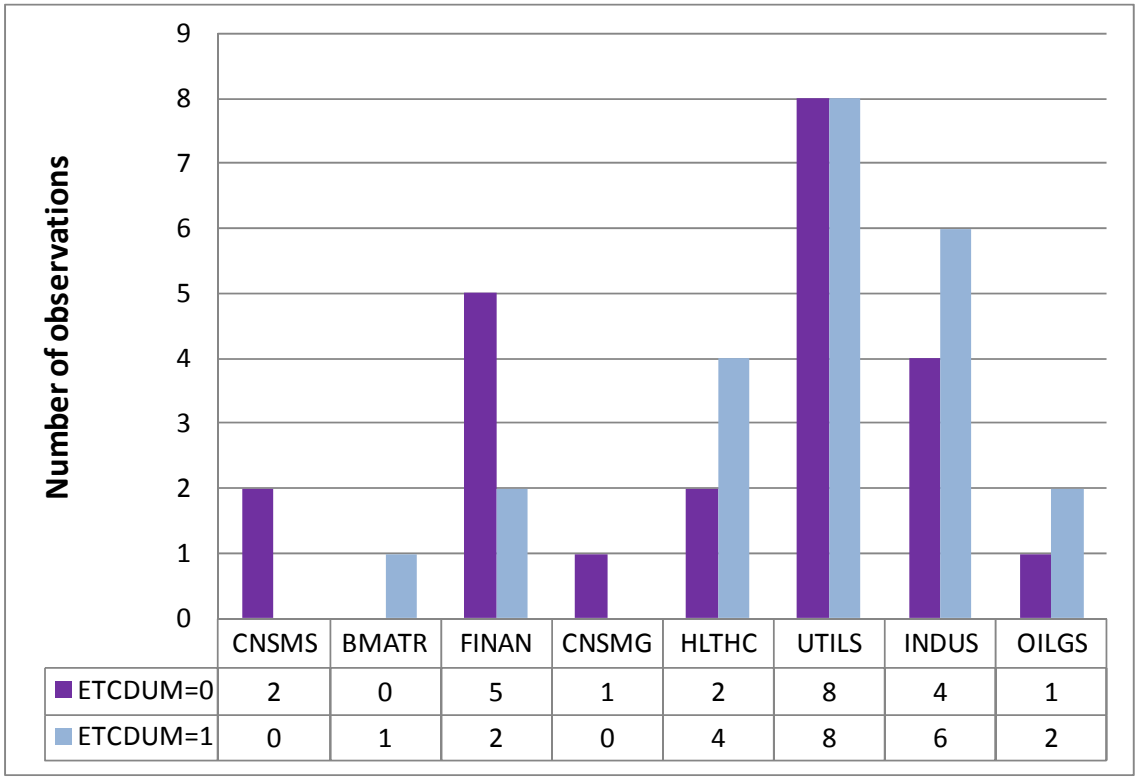
Due to data limitations, the Table 6.1 analyses use small samples of events in which it is not possible to incorporate industry control variables. If one particular industry dominates the sample, then it is possible that the findings are driven by, for example, long-term projects such as energy-generation in the utilities industry, which typically require a long time to gain consent approval. In such a case, one would expect to find that the events are not evenly distributed between the *ETCDUM* categories when analysed by industry. Figure 6.1 charts the industry affiliation for the 33 events analysed in Table 6.1, and reveals that the events in the regression sample are fairly well distributed between the short and long *ETCDUM* categories for each industry. Furthermore, in Chapter 4 Section 4.4.3, historical industry-level *TCA* was found to be unrelated to actual project-level *TCA*, possibly due to the considerable variation of firm *TCA* within each industry. Together, these findings suggest that it is the expected time to consent measure, and not the industry affiliation, that is predicting the actual time to consent.

Figure 6.1 Regression sample industry affiliations by short (ETCDUM=0) or long (ETCDUM=1) expected time to consent (n=33)



	CNSMS	BMATR	FINAN	CNSMG	HLTHC	UTILS	INDUS	OILGS
ETCDUM=0	2	0	2	0	2	5	2	1
ETCDUM=1	0	1	1	0	4	6	6	1

Figure 6.2 Full sample industry affiliations by short (ETCDUM=0) or long (ETCDUM=1) expected time to consent (n=46)



	CNSMS	BMATR	FINAN	CNSMG	HLTHC	UTILS	INDUS	OILGS
ETCDUM=0	2	0	5	1	2	8	4	1
ETCDUM=1	0	1	2	0	4	8	6	2

Further analyses in this thesis use a larger sample of 46 *ETCDUM* observations than the analysis above, and therefore industry affiliations could still drive subsequent findings if the distribution of industries is not roughly equal across the two *ETCDUM* categories. Redrawing Figure 6.1 to consider the industry affiliations of the larger sample of all 46 *ETCDUM* observations across the two categories in Figure 6.2, the distribution of industry affiliations is observed to remain relatively consistent across the two *ETCDUM* categories. This gives some reassurance that the *ETCDUM* measure is unlikely to be a proxy for industry affiliation.

Taken together, these results indicate support for hypothesis *H1*, and give some validation of the *ETCDUM* variable as a predictor of a project's actual time to gain consent approval. As was argued earlier in Chapter 4, the time to gain resource consent approval can be viewed as an indicator of resource consent compliance costs (Office of the Associate Minister for the Environment, 2004). Accordingly, the constructed *ETCDUM* variable is used in subsequent analyses in this thesis as an indicator of expected resource consent compliance costs.

6.3 The market reaction to project initiation announcements

6.3.1 Descriptive statistics and correlations

The testing of hypotheses *H2* and *H3* uses event study methodology to consider alternative shareholder wealth maximisation and rational expectations explanations for stock market reactions to project initiation announcements. Descriptive statistics for the full sample and for the expected time to consent subsamples partitioned at the median are presented in Panel A of Table 6.2. Differences in means and medians between the subsamples are assessed using t-tests and Wilcoxon rank-sum tests, respectively. The mean (median) *ETC* in months is 18.19 (11.15) for the sample of 46 *ETC* observations, 4.00 (4.00) for the short *ETC* subsample, and 32.38 (24.00) for the long *ETC* subsample, with the differences between the subsamples being statistically significant at the 1% level.

Table 6.2 Descriptive sample characteristics and correlations

Panel A: Descriptive sample characteristics by expected time to consent (ETC)

	Full Sample (1)			Short ETC (2)			Long ETC (3)			Difference (2)-(3)	
Variables	n	Mean	Median	n	Mean	Median	n	Mean	Median	Mean	Median
ETC (months)	46	18.19	11.15	23	4.00	4.00	23	32.38	24.00	-28.38[a]	-22.00[a]
LNMVA	55	20.13	20.17	23	20.20	20.12	23	20.40	20.34	-0.21	-0.22
MB	55	1.27	1.16	23	1.17	1.13	23	1.39	1.29	-0.22[b]	-0.16[c]
LEV (%)	55	39.27	38.67	23	43.31	40.90	23	35.47	37.28	7.84	3.62
INV/BVA (%)	35	13.08	10.05	17	9.69	9.09	15	15.82	10.05	-6.13	-0.96

Panel B: Pearson correlations among the dependent, ETC dummy and control variables (n)

	ETCDUM	LNMVA	MB	LEV	INV/BVA	RC	DISCLOS	MEDIA	REFORM	JV
CAR(0,+1)	0.2688[c]	-0.3972[a]	0.1328	-0.0797	0.2786	0.0515	-0.2084	0.1901	0.0069	-0.0370
	(46)	(55)	(55)	(55)	(35)	(55)	(55)	(55)	(55)	(55)
CAR(0,+2)	0.2726[c]	-0.3547[a]	0.0269	0.0814	0.2227	-0.0101	-0.2433[c]	0.1874	-0.1187	0.0051
	(46)	(55)	(55)	(55)	(35)	(55)	(55)	(55)	(55)	(55)
ETCDUM		0.0895	0.2879[b]	-0.2325	0.2496	-0.2414	-0.1741	0.4587[a]	0.0000	-0.0548
		(46)	(46)	(46)	(32)	(46)	(46)	(46)	(46)	(46)
LNMVA			0.0444	0.3257[b]	-0.5239[a]	0.3082[b]	-0.1205	0.1212	0.1907	-0.0255
			(55)	(55)	(35)	(55)	(55)	(55)	(55)	(55)
MB				-0.1349	0.0644	0.0499	-0.0660	0.2790[b]	-0.2333[c]	0.2391[c]
					(35)	(55)	(55)	(55)	(55)	(55)
LEV					-0.2223	0.0252	0.1066	0.0374	-0.1043	-0.1649
						(55)	(55)	(55)	(55)	(55)
INV/BVA						-0.2061	-0.1057	0.0376	-0.3283[b]	0.2869[c]
						(35)	(35)	(35)	(35)	(35)

[a, b] and [c] denote statistical significance at the 1%, 5% and 10% levels, respectively, using two-tailed tests

Summary statistics are presented for the control variables of firm size (*LNMVA*), market/book (*MB*), leverage (*LEV*) and relative investment size (*INV/BVA*). *MB* is the only control variable for which significant differences are found between the subsamples, with *MB* being significantly higher on average for long *ETC* projects. Using Tobin's *q* as a proxy for growth opportunities, Szewczyk, Tsetsekos and Zantout (1996) find that announcements of intended increases in R&D are found to generate significantly positive abnormal returns for high-*q* firms, but not for low-*q* firms. Similarly, growth opportunities may be greater for firms that undertake long *ETC* projects.

Two-day (0,+1) and three-day (0,+2) cumulative abnormal returns are estimated for all 55 project initiation announcements in the sample. Panel B of Table 6.2 presents the Pearson correlation coefficients among the dependent, *ETCDUM* and control variables.

6.3.2 Abnormal returns

Table 6.3 reports the event study results of the analysis of abnormal returns using the Corrado-Zivney variance-adjusted rank test (T_{CZ}), the Patell (1976) standardised abnormal return test (T_{PATELL}), the Boehmer, Musumeci and Poulsen (1991) standardised cross-sectional test (T_{BMP}), and the Corrado (1989) rank test ($T_{CORRADO}$). The daily results around the event day for the entire sample reported in Panel A reveal weak but consistent evidence of abnormal returns on day 1. The cumulative abnormal returns (*CAR*) are also given for various event windows. The two-day (0,+1) and three-day (0,+2) mean (median) *CAR* are 0.73% (0.41%) and 0.86% (0.24%), respectively, and vary in significance from the 10% to the 1% levels. These results provide moderate evidence that project initiation announcements are associated with positive valuation effects. The magnitude of the two-day results is broadly similar to those observed in comparable studies of capital investment announcements. For example, two-day mean *CAR* for similar capital investment announcements are found to be 0.33% in the US (Woolridge & Snow, 1990), 0.86% in Singapore (Chen & Ho, 1997), 0.39% in the UK (Burton et al., 1999) and 0.30% in Korea (W. S. Kim et al., 2005).

Table 6.3 Abnormal returns and cumulative abnormal returns around project initiation announcements

	Abnormal returns			Ranked variance-adjusted standardised abnormal returns					
Event days	Mean	Median	Propn. pos. returns	Mean	Std dev[3]	T_{CZ}	T_{PATELL}	T_{BMP}	$T_{CORRADO}$
Panel A. Entire sample (n=55)									
-2	-0.0014	-0.0003	0.49	-0.2779	0.3173	-0.88	-0.59	-0.63	-0.83
-1	-0.0033	-0.0020	0.33	-0.5424	0.3173	-1.71[c]	-1.53	-1.58	-1.66
0	0.0033	0.0005	0.55	0.4851	0.3173	1.53	1.12	0.96	1.51
1	0.0040	0.0022	0.58	0.5882	0.3173	1.85[c]	2.08[b]	1.99[b]	1.89[c]
2	0.0013	0.0006	0.53	0.3838	0.3173	1.21	0.25	0.28	1.15
Event window									
(-1,0)	0.0000	-0.0016	0.44	-0.0573	0.4487	-0.13	-0.29	-0.31	-0.10
(0,+1)	0.0073	0.0041	0.58	1.0733	0.4487	2.39[b]	2.25[b]	1.97[b]	2.41[b]
(-1,+1)	0.0040	0.0011	0.56	0.5308	0.5495	0.97	0.98	0.97	1.01
(0,+2)	0.0086	0.0024	0.56	1.4570	0.5495	2.65[a]	1.96[c]	2.14[b]	2.63[a]
(-2,+2)	0.0039	0.0079	0.56	0.6367	0.7095	0.90	0.59	0.61	0.92
Panel B. Excluding ETC=0 (n=47)									
-2	-0.0013	-0.0010	0.45	-0.2719	0.3253	-0.84	-0.63	-0.69	-0.80
-1	-0.0040	-0.0024	0.32	-0.5805	0.3253	-1.78[c]	-1.59	-1.58	-1.82[c]
0	0.0037	0.0005	0.55	0.4599	0.3253	1.41	1.17	0.95	1.49
1	0.0041	0.0023	0.60	0.6306	0.3253	1.94[c]	2.26[b]	2.18[b]	1.92[c]
2	0.0009	-0.0001	0.50	0.2640	0.3253	0.81	0.04	0.05	0.81
Event window									
(-1,0)	-0.0003	-0.0031	0.40	-0.1205	0.4600	-0.26	-0.29	-0.30	-0.23
(0,+1)	0.0078	0.0054	0.57	1.0906	0.4600	2.37[b]	2.43[b]	2.10[b]	2.41[b]
(-1,+1)	0.0038	0.0007	0.53	0.5101	0.5634	0.91	1.08	1.09	0.92
(0,+2)	0.0086	0.0007	0.53	1.3546	0.5634	2.40[b]	1.98[b]	2.08[b]	2.44[b]
(-2,+2)	0.0034	0.0066	0.53	0.5022	0.7273	0.69	0.56	0.57	0.72

[a, b] and [c] denote statistical significance at the 1%, 5% and 10% levels, respectively, using two-tailed tests

If, counter to the hypothesis *H2a* predictions, the market expects new projects to have net negative valuation implications when a firm incurs high resource consent compliance costs, then the inclusion in the sample of new projects for which resource consents have already been granted (*ETC*=0) is likely to bias the results upward, as the compliance costs associated with obtaining the resource consents have already been incurred. Panel B of Table 6.3 reveals that removal from the sample of the 8 project initiations with *ETC*=0 has no material impact on the Panel A results.

The robustness of the Table 6.3 results is tested and presented in Appendix 6 by conducting the analyses using market-adjusted returns (Table A6.1), the alternate

[3] The Corrado-Zivney rank test uses the standard deviation of abnormal returns over the entire sample period. Accordingly the reported standard deviation is identical for day 0 and each of the surrounding days.

market index (Table A6.2) and a longer estimation period (Table A6.3). The results remain materially unchanged.

The evidence presented above provides moderate support for the shareholder wealth maximisation hypothesis *H2* that the stock market reaction to capital expenditure project initiation announcements is positive. The findings suggest that new projects are valued positively by the market. Conversely, the evidence does not support the rational expectations hypothesis prediction in *H3* that the stock market reaction to capital expenditure project initiation announcements is neutral.

6.4 The influence of expected resource consent compliance costs on stock market reactions to project initiation announcements

In order to test hypotheses *H2a* and *H3a* with respect to the influence of expected resource consent compliance costs on market reactions to project initiation announcements, the sample is divided by the median *ETC* in Table 6.4. Projects with a short *ETC* (Panel A) have insignificant mean (median) *CAR* (0,+1) of -0.14% (0.11%) and *CAR* (0,+2) of -0.06% (-0.05%). In contrast, the two-day (0,+1) and three-day (0,+2) mean (median) *CAR* for projects with long *ETC* (Panel B) are 1.39% (0.74%) and 1.33% (1.05%), respectively, being statistically significant at the 5% level for the Corrado-Zivney rank test, and at the 5% or 1% levels for the robustness tests.

There is also some evidence of negative abnormal returns for the long *ETC* subsample on day -1. The two most negative day -1 abnormal returns appear to be driven by bad industry-wide news unrelated to the subsequent day 0 announcements. Furthermore, large abnormal returns are not always associated with public news (P. Ryan & Taffler, 2004), so the day -1 abnormal return is not necessarily caused by the project announcement. Woolridge and Snow (1990) and Kim, Lyn, Park and Zychowicz (2005) find evidence of day -1 negative (but insignificant) abnormal returns in their short-investment duration and Chaebol subsamples, respectively.

Table 6.4 Abnormal returns and cumulative abnormal returns around project initiation announcements by expected time to consent

	Abnormal returns			Ranked variance-adjusted standardised abnormal returns					
Event days	Mean	Median	Propn. pos. returns	Mean	Std dev	T_{CZ}	T_{PATELL}	T_{BMP}	$T_{CORRADO}$
Panel A. Short ETC (n=23)									
-2	-0.0042	-0.0026	0.48	-0.2923	0.3043	-0.96	-1.06	-0.87	-1.19
-1	-0.0012	-0.0018	0.35	-0.3179	0.3043	-1.04	-0.75	-0.95	-0.52
0	-0.0037	0.0003	0.52	-0.0034	0.3043	-0.01	-1.20	-1.03	-0.03
1	0.0024	0.0021	0.61	0.3025	0.3043	0.99	0.43	0.54	0.87
2	0.0008	-0.0007	0.48	0.1453	0.3043	0.48	-0.36	-0.36	0.44
Event window									
(-1,0)	-0.0049	-0.0031	0.35	-0.3213	0.4303	-0.75	-1.38	-1.82[c]	-0.39
(0,+1)	-0.0014	0.0011	0.52	0.2991	0.4303	0.69	-0.54	-0.59	0.59
(-1,+1)	-0.0025	-0.0006	0.48	-0.0188	0.5270	-0.04	-0.87	-1.14	0.18
(0,+2)	-0.0006	-0.0005	0.39	0.4444	0.5270	0.84	-0.67	-0.95	0.74
(-2,+2)	-0.0060	-0.0020	0.43	-0.1658	0.6804	-0.24	-1.31	-1.43	-0.20
Panel B. Long ETC (n=23)									
-2	0.0009	0.0019	0.57	-0.0137	0.2968	-0.05	0.08	0.12	-0.03
-1	-0.0072	-0.0024	0.30	-0.6102	0.2968	-2.06[c]	-1.90[c]	-1.86[c]	-2.11[b]
0	0.0077	0.0005	0.52	0.3948	0.2968	1.33	1.95[c]	1.65[c]	1.33
1	0.0062	0.0030	0.61	0.4956	0.2968	1.67	2.33[b]	1.75[c]	1.74[c]
2	-0.0006	0.0011	0.57	0.2154	0.2968	0.73	0.31	0.34	0.60
Event window									
(-1,0)	0.0006	-0.0016	0.44	-0.2154	0.4197	-0.51	0.03	0.03	-0.55
(0,+1)	0.0139	0.0074	0.61	0.8905	0.4197	2.12[b]	3.06[a]	2.24[b]	2.18[b]
(-1,+1)	0.0067	0.0044	0.61	0.2803	0.5141	0.55	1.39	1.16	0.56
(0,+2)	0.0133	0.0105	0.65	1.1058	0.5141	2.15[b]	2.66[a]	2.47[b]	2.13[b]
(-2,+2)	0.0070	0.0086	0.65	0.4820	0.6636	0.73	1.24	1.29	0.69

[a, b] and [c] denote statistical significance at the 1%, 5% and 10% levels, respectively, using two-tailed tests

Figure 6.3 plots the full sample and *ETC* subsample *CAR* for 20 days around the project initiation announcements. The *CAR* for the long *ETC* subsample have an overall upward trend commencing several days before the project announcement, peaking on day +1, and then gradually trending downward after that. In contrast, the *CAR* for the short *ETC* group trend downwards in advance of the announcement from day -6 until day 0, from which point forward no particular trend is discernable. In both subsamples, much of market reaction precedes the announcement, suggesting that the announcement is anticipated by some investors. This is consistent with Del Brio, Perote and Pindado (2003), who present evidence of pre-event trading prior to Spanish capital investment announcements from 1991 to 1997. Only for the long *ETC* subsample is there any indication of a surprise element on the announcement day.

Figure 6.3 Full sample and ETC subsample cumulative abnormal returns around project initiation announcements

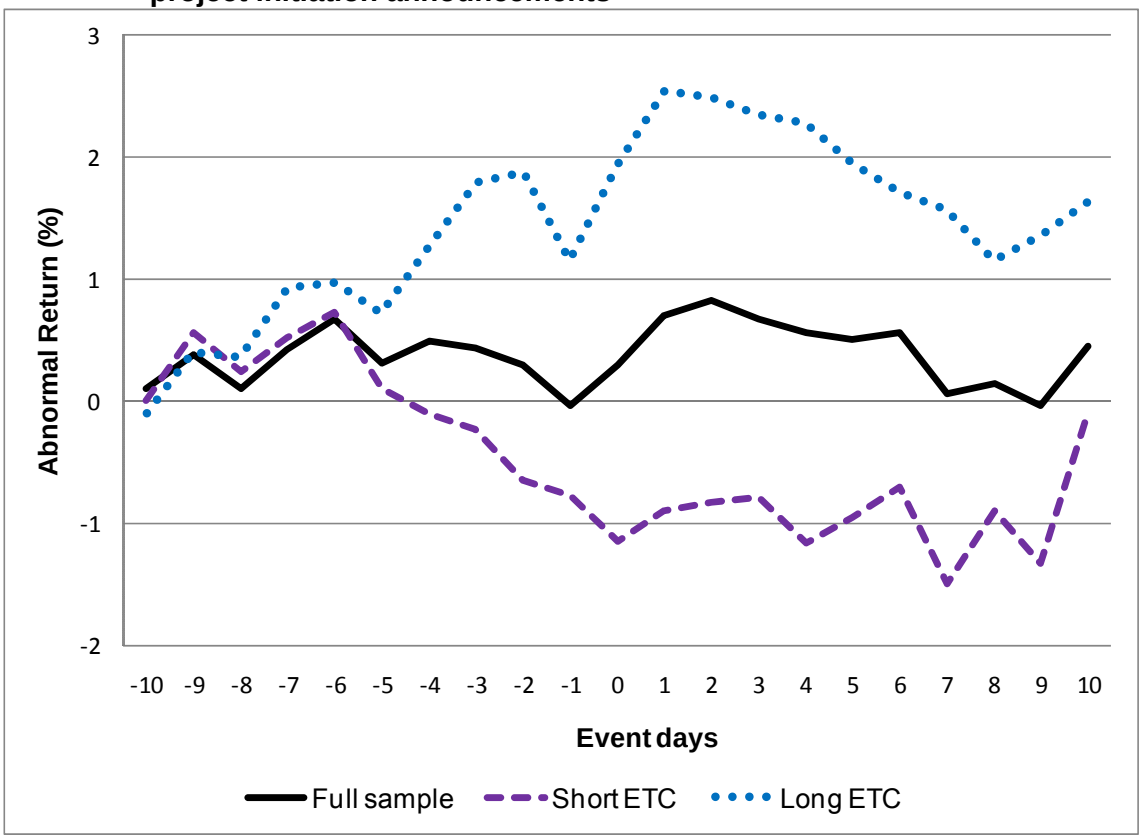


Table 6.5 presents t-tests and Wilcoxon rank sum tests for the differences between the short and long *ETC* group standardised abnormal returns. The test statistics for the differences in the *CAR* are consistently negative, indicating that the *CAR* for the short *ETC* group are less than those for the long *ETC* group. The t-statistics are statistically significant at the 5% level for the (0,+1) and (0,+2) windows, and at the 10% level for the (-2,+2) window. However, the Wilcoxon rank sum test for equality of medians indicates that differences are statistically significant (at the 5% level) only for the (0,+2) window.

Overall, these results are consistent with the shareholder wealth maximisation hypothesis *H2a,* that projects are valued more favourably if they carry higher resource consent compliance costs as measured by their expected time to consent. Also, the finding of positive event-window abnormal returns for the long *ETC* group runs counter to the *H3a* rational expectations hypothesis prediction of zero abnormal returns irrespective of the expected size of the consent compliance costs.

Table 6.5 Comparison of standardised abnormal returns and standardised cumulative abnormal returns around project initiation announcements by expected time to consent

Event days	Subsample standardised abnormal returns				Difference	
	Short ETC n=23		Long ETC n=23		t-statistic	Wilcoxon Z
	(1) Mean	(2) Median	(3) Mean	(4) Median	(1)-(3)	(2)-(4)
-2	-0.2237	-0.1169	0.0179	0.1547	-0.81	-0.92
-1	-0.1590	-0.0733	-0.4037	-0.2178	0.89	0.79
0	-0.2513	0.0126	0.4093	0.0481	-1.88[c]	-1.32
1	0.0983	0.1139	0.5084	0.2405	-1.23	-0.90
2	-0.0746	-0.0165	0.0679	0.1001	-0.50	-0.33
Event window						
(-1,0)	-0.2903	-0.0871	-0.0002	-0.0749	-1.14	-0.90
(0,+1)	-0.1099	0.0110	0.6465	0.2877	-2.15[b]	-1.47
(-1,+1)	-0.1810	-0.0363	0.2918	0.1679	-1.55	-1.47
(0,+2)	-0.1318	-0.0114	0.5673	0.3332	-2.54[b]	-2.17[b]
(-2,+2)	-0.2720	-0.0836	0.2649	0.2880	-1.87[c]	-1.42

[a, b] and [c] denote statistical significance at the 1%, 5% and 10% levels, respectively, using two-tailed tests

To provide further evidence regarding hypotheses *H2a* and *H3a,* Table 6.6 presents cross-sectional regression analyses of project announcement *CAR* for the (0,+1) and (0,+2) windows. The t-statistics are calculated using White (1980) heteroskedasticity-consistent standard errors. In Models 1 and 2, *ETCDUM* is the sole explanatory variable, and the coefficients are positive with a level of significance of 10%. When the explanatory variables for firm size (*LNMVA*) and relative project size (*INV/BVA*) are added in Models 3 and 4, the coefficient for *ETCDUM* remains significantly positive at the 10% level for *CAR* (0,+1), but becomes insignificant for *CAR* (0,+2). Robustness tests in Appendix 6 Table A6.4 show that the *ETCDUM* coefficients in Models 3 and 4 are significant when the *INV/BVA* is replaced in Models 7 to 14 by the control variables *REFORMDUM*, *JVDUM*, *MB* and *LEV* discussed in Chapter 5, Section 5.3.4. Further, Models 15 and 16 in Table A6.4 show that the Models 3 and 4 coefficients for project size (*INV/BVA*) remain insignificant when the market value of equity is used in place of the book value of assets. The consistently negative coefficient (1% level) for *LNMVA* is consistent with similar studies suggesting that small firms experience greater information asymmetry (Chen, 2006; Chen & Ho, 1997; E. Jones et al., 2004). The sample size for Models 3 and 4 is relatively small as the project size is disclosed in only 32 out of the 46 announcements for which an *ETCDUM* estimate is available. Given the data limitations and the insignificant t-statistics associated with project size in the models, it is dropped from consideration in subsequent models.

Table 6.6 Cross-sectional regression analyses of project initiation announcement cumulative abnormal returns, (t-statistics)

Variable	Predicted sign	CAR (0,+1)) Model 1 (n=46)	CAR (0,+2) Model 2 (n=46)	CAR (0,+1) Model 3 (n=32)	CAR (0,+2) Model 4 (n=32)	CAR (0,+1) Model 5 (n=46)	CAR (0,+2) Model 6 (n=46)
Constant	n/a	-0.0012 (-0.29)	-0.0003 (-0.06)	0.2455 (3.79)[a]	0.1810 (2.46)[b]	0.2749 (4.82)[a]	0.2183 (4.73)[a]
ETCDUM	+	0.0151 (1.89)[c]	0.0136 (1.92)[c]	0.0149 (1.97)[c]	0.0120 (1.62)	0.0197 (2.55)[a]	0.0159 (2.42)[b]
LNMVA	-			-0.0121 (-3.83)[a]	-0.0087 (-2.49)[b]	-0.014 (-4.79)[a]	-0.0109 (-4.85)[a]
INV/BVA	+			-0.0002 (-0.01)	0.0008 (0.02)		
RCDUM	+					0.0173 (2.01)[b]	0.0122 (1.69)[c]
DISCLOSDUM	n/a					-0.0125 (-1.89)[c]	-0.0151 (-2.37)[b]
Adjusted R^2		0.051	0.053	0.247	0.173	0.358	0.315

[a, b] and [c] denote statistical significance at the 1%, 5% and 10% levels, respectively, using two-tailed tests

Models 5 and 6 add two further control variables, *RCDUM* and *DISCLOSDUM*. *RCDUM* is added to test for potential information effects when resource consents are specifically mentioned in the project initiation announcement. The t-statistics for *RCDUM* are positive and statistically significant at the 5% and 10% levels for the *CAR* (0,+1) and *CAR* (0,+2) models, respectively, indicating that resource consent information is positively valued, possibly due to uncertainty reduction. If the announcement is a first disclosure then according to the significantly negative coefficient on *DISCLOSDUM*, then the market reaction is negative. Conversely, anticipated announcements generate more positive reactions than non-anticipated (first) announcements, consistent with the positive feedback theory (Shiller, 2003) which suggests that speculative news attracts investors' attention generating positive sentiment which drives further share price increases. The t-statistics for *ETCDUM* remain positive and significant at the 1% and 5% levels in the (0,+1) and (0,+2) windows. Robustness tests of the Model 5 and 6 results are presented as Models 17 to 26 in Appendix 6 Table A6.5. Models 17 and 18 rerun the Model 5 and 6 equations without an outlying observation that could potentially influence the results. The most material changes are that the level of significance for the *ETCDUM* coefficient declines to 5% in the (0,+1) window, and the coefficient on the *RCDUM* variable is no longer significant. In Models 19 and 20, a dummy variable is added to control for the potential dominance of energy generation projects (*ENERGDUM*) in the sample (15 of the 46 observations), but the coefficients are insignificant. Next, in Models 21 and 22 a dummy variable *MEDIADUM*, is added to test for the possibility that investors' reactions to project initiation announcements are positively associated with media coverage. The coefficients on *MEDIADUM* are not statistically significant, while the *ETCDUM* and

RCDUM coefficients remain significant. In further testing, the natural log of the market value of equity (*LNMVE*) is substituted in place of *LNMVA* as a measure of firm size in Models 23 and 24, resulting in no material changes to the previous Model 5 and 6 findings. Finally, in the last of the robustness tests in Models 25 and 26, the potential influence of liquidity is tested using the *VOL* variable. Counter to expectations, the coefficients are positive, indicating that more thickly-traded shares earn greater abnormal returns, however, statistical significance is indicated only in the (0,+1) window. Nevertheless, the coefficients for the main variables of interest, *ETCDUM* and *RCDUM*, remain positive and statistically significant.

Overall, the above findings are consistent with the shareholder wealth maximisation hypothesis *H2* and the corollary predictions in *H2a*, that the event-window abnormal returns are greater for projects with higher expected resource consent compliance costs. In accepting hypothesis *H2a*, the *H3a* prediction is rejected that all event-window abnormal returns are equal to zero, irrespective of the expected size of project resource consent compliance costs. Table 6.6, A6.4 and A6.5 results indicate that the average values of capital expenditure projects expected to experience long consenting processes exceed those with short consenting processes by about 1.51% to 1.97% (using *CAR* (0,+1) as the dependent variable). Applying these percentages to the market value of each announcer's equity at the fiscal year-end prior to the announcement, the estimated average announcement net benefit expressed in 1991 dollars is $13.0 to $17.0 million (relative to the average market value of equity of $860.8 million). In 2007 dollars, this translates to a net benefit of $18.0 to $23.4 million (relative to the average market value of equity of $1,189.3 million). These results suggest that on average, the marginal expected benefits of undertaking environmentally-sensitive projects expected to have relatively long times to gain consent approval are substantially greater than the marginal expected compliance costs resulting from lengthy consent processing times.

In contrast, the rational expectations hypothesis posited in *H3* predicts that the stock market reaction to capital expenditure project initiation announcements will be neutral. Partial support is found for this hypothesis, principally for projects with low expected resource consent compliance costs. A possible interpretation of this finding is that lower compliance costs result in fewer barriers to impede industry competitors and new entrants, hence competition is greater and the opportunity for incumbent firms to earn economic profits is diminished.

6.5 Conclusion

In this chapter, the hypotheses presented in *H1* to *H3a* are tested to assess the role of environmental regulatory delay in explaining capital market reactions to capital expenditure announcements. The shareholder wealth maximisation hypothesis (*H2*) predicts that the stock market reacts favourably to project initiation announcements because managers undertake strategic investments that have expected NPVs greater than zero. The corollary prediction (*H2a*) is that event-window abnormal returns are greater for projects with higher expected resource consent compliance costs because the strategic benefits associated with high compliance costs exceed the expected costs of compliance. In contrast, the rational expectations hypothesis predicts that project announcement abnormal returns are equal to zero (*H3*) and are unaffected by expected resource consent costs (*H3a*) because competitive conditions drive abnormal returns to zero.

First, a measure of expected resource consent compliance costs is constructed. Consistent with hypothesis *H1*, the expected time for a project to gain resource consent approval (*ETCDUM*) is positively related to its actual time to gain consent approval or abandonment. Next, the constructed *ETCDUM* variable is used as an indicator of expected resource consent compliance costs for new project announcements. Consistent with the shareholder wealth maximisation hypothesis *H2*, and counter to the rational expectations hypothesis *H3*, tests of the abnormal returns from a sample of project initiation announcements between 1991 and 2007 indicate that on average, the stock market positively values news of project initiations. Further analysis indicates support for hypothesis *H2a*, as the positive valuation is driven by those project announcements for which the expected time to gain consent approval is long. This finding supports prior research suggesting that environmental regulations that assign property rights to scarce resources may allow permit-holders to earn economic profits (Maloney & McCormick, 1982). The findings of positive valuations for long time to consent projects are also consistent with the view that firms that incur greater sunk costs of entry, such as regulatory compliance costs, are able to create a sustainable advantage that competitors cannot easily replicate (Mason & Polasky, 1994). Furthermore, the time delay for resource consent approval and high level of compliance costs incurred may allow firms to develop specialised capabilities (e.g. Bernardo & Chowdhry, 2002; Hart, 1995; Nehrt, 1996) and/or to deter industry competitors and new entrants (e.g. Helland & Matsuno, 2003), thereby increasing expected project NPVs. In contrast, consistent with the rational expectations

hypothesis *H3*, announcements of new projects for which expected consent-processing time is short generate a neutral stock market reaction. For these projects, the shorter consenting times and lower compliance costs may not be sufficient to allow the firms to develop specialised capabilities or to impose barriers to entry, thereby driving the expected project NPVs to zero.

Additional evidence from the cross-sectional regression analyses suggests that for firms that disclose resource consent information (*RCDUM*), there may be an average economic benefit of about 1.29% to 1.73% (from the regressions with *CAR* (0,+1) as the dependent variable) of their market capitalisation. This is in addition to any benefits gained from undertaking projects with long expected times to gain consent approval. Applying these percentages to the market value of each announcer's equity at the fiscal year-end prior to the announcement, the estimated average announcement net benefit of disclosure is $8.7 to $11.6 million at 1991 price-levels, or $12.0 to $16.1 million at 2007 price-levels. However, given that the level of statistical significance varies over the different models, these results should be viewed as tentative pending further evidence of the economic effects of resource consent announcements to be presented in the next tests in connection with the second research aim.

Chapter 7: Empirical results – The market reaction to resource consent announcements

7.1 Introduction

This chapter presents empirical evidence from the tests of hypotheses *H4* to *H10* to address the second research aim to investigate the capital market impact of resource consent announcements. Section 7.2 presents event study evidence and cross-sectional regression tests of market volatility around a wide variety of resource consent announcements in order to test hypotheses *H4* to *H6* regarding the information content of resource consent information. Section 7.3 then presents further results from an event study and cross-sectional regression of abnormal returns around resource consent announcements to gain insights into their economic impact as posited in hypotheses *H7* to *H10*. The last section provides a summary and conclusion for the chapter.

7.2 The information content of resource consent announcements

7.2.1 Entire sample absolute abnormal returns

Hypothesis *H4* tests the information content of project-related resource consent announcements by assessing event-day volatility. The means and medians for daily and cumulative absolute abnormal returns which are presented in Panel A of Table 7.1 differ markedly, confirming earlier findings of non-normality of returns. Accordingly, further analyses in this chapter present median rather than mean absolute abnormal returns. As discussed in Chapter 5, the Corrado (1992) rank test is robust to non-normality and other problems that violate the assumptions of parametric tests, and accordingly is used in the following analysis of absolute abnormal returns *(AAR)*.

Results reveal that abnormal return volatility is significantly greater than zero not only as predicted on event day 0, but also on day -2.

Table 7.1 Analysis of ranked absolute abnormal returns

Event days	Absolute abnormal return		Ranked absolute abnormal returns		
	Mean	Median	Mean	Std dev	T
Panel A. Entire sample (n=90)					
-2	0.0136	0.0090	0.4377	0.2669	1.64[b]
-1	0.0156	0.0077	0.2882	0.2669	1.08
0	0.0220	0.0090	0.7005	0.2669	2.62[a]
1	0.0145	0.0067	-0.2138	0.2669	-0.80
2	0.0155	0.0091	0.3335	0.2669	1.25
Event window					
(-1,0)	0.0294	0.0124	0.9888	0.3775	2.62[a]
(0,+1)	0.0328	0.0135	0.4867	0.3775	1.29[c]
(-1,+1)	0.0374	0.0146	0.7749	0.4623	1.68[b]
(-2,0)	0.0298	0.0126	1.4264	0.4623	3.09[a]
(-2,+2)	0.0423	0.0203	1.5461	0.5969	2.59[a]
Panel B. Entire sample without days ±2 contaminated events (n=82)					
-2	0.0127	0.0083	0.3923	0.2707	1.45[c]
-1	0.0154	0.0075	0.1808	0.2707	0.67
0	0.0220	0.0086	0.6099	0.2707	2.25[b]
1	0.0148	0.0065	-0.2591	0.2707	-0.96
2	0.0161	0.0091	0.3408	0.2707	1.26
Event window					
(-1,0)	0.0290	0.0119	0.7907	0.3828	2.07[b]
(0,+1)	0.0332	0.0135	0.3507	0.3828	0.92
(-1,+1)	0.0372	0.0139	0.5315	0.4689	1.13
(-2,0)	0.0285	0.0098	1.1829	0.4689	2.52[a]
(-2,+2)	0.0413	0.0181	1.2646	0.6053	2.09[b]

[a, b] and [c] denote statistical significance at the 1%, 5%, and10% levels, respectively, using a one-tailed test

To consider investors' actions around the event day, cumulative absolute abnormal returns *(CAAR)* are evaluated over several different event windows. All windows show evidence of abnormal volatility, suggesting that some investors may be anticipating the arrival of information, and that the news effects persist beyond the event day.

Given the paucity of data, contaminating announcements were initially eliminated only during the (-1,+1) event window. Eight observations have contaminated announcements on day -2 or +2, so these are now temporarily deleted from the data set and the results are re-analysed with a smaller sample of 82. The results presented in Panel B of Table 7.1 are materially unchanged, although the level of significance of *AAR* has declined with three of the five event-window *CAAR* remaining significant. These findings suggest that the observed significant volatility on day -2 is due to the resource consent announcements and not to extraneous events.

The daily results are robust to alternative analyses, being the use of an alternative market index to estimate market model absolute abnormal returns (Appendix Table A7.1), the use of market-adjusted returns to estimate excess returns (Appendix Table A7.2), and to a variation in the sample period (-170, +10) although in the latter case the level of significance of the day 0 *AAR* declines to 5% (Appendix Table A7.3).

In summary, the above findings allow the acceptance of hypothesis *H4* that the event-day absolute abnormal returns of resource consent announcements are significantly greater than zero. The finding of excess volatility suggests that on average, resource consent announcements contain information that investors perceive to be important. This is consistent with evidence in Chapter 6 that suggests there is an economic benefit associated with the disclosure of resource consent information in connection with project initiation announcements. Furthermore, the indication of possible excess volatility arising prior to resource consent announcements is consistent with suggestions of McNichols and Trueman (1994) and Kim and Verrecchia (1997) that the prospect of a public announcement may stimulate pre-event private information acquisition and trading by investors.

7.2.2 Analysis of subsample absolute abnormal returns

Hypothesis *H5* considers how stock exchange and legislative reforms from December 2002 to August 2003 may have affected announcement return volatility. For example, if there are fewer delays in the disclosure of resource consent news due to the December 2002 introduction of the continuous disclosure regime, there would be less opportunity for pre-event private information gathering and lower return volatility in the post-reform period. To gain insights into the information diffusion process, the ranked absolute abnormal returns are partitioned in Table 7.2 according to the December 2002 reforms and evaluated using the Corrado rank test. A one-tailed test is used to test for the presence of absolute abnormal returns significantly greater than zero. The Table 7.2 results present no clear evidence of increased speed of information diffusion in the post-reform period. The Corrado rank test finds that abnormal volatility is significantly greater than zero only on day -1 in the pre-reform period and on days -2 and 0 in the post-reform period.

Table 7.2 Analysis of ranked absolute abnormal returns, pre- and post-reform, December 2002

Event days	Ranked absolute abnormal returns						Absolute abnormal returns		
	Pre-reform n=38			Post-reform n=52			Pre-reform	Post-reform	Wilcoxon Z
	Mean	Std dev	T	Mean	Std dev	T	(1) Median	(2) Median	(1)-(2)
-2	0.2270	0.2770	0.82	0.3818	0.2614	1.47[c]	0.0074	0.0095	-0.18
-1	0.7341	0.2770	2.65[a]	-0.2483	0.2614	-0.95	0.0101	0.0053	2.32[a]
0	0.2788	0.2770	1.01	0.6832	0.2614	2.61[a]	0.0077	0.0100	-0.87
1	0.0988	0.2770	0.36	-0.3657	0.2614	-1.40	0.0080	0.0058	0.80
2	0.2717	0.2770	0.98	0.2065	0.2614	0.79	0.0101	0.0085	0.62
Event window									
(-1,0)	1.0129	0.3917	2.59[a]	0.4349	0.3696	1.18	0.0165	0.0095	2.46[a]
(0,+1)	0.3776	0.3917	0.96	0.3174	0.3696	0.86	0.0132	0.0136	0.54
(-1,+1)	1.1117	0.4797	2.32[b]	0.0691	0.4527	0.15	0.0188	0.0117	2.01[b]
(-2,0)	1.2399	0.4797	2.58[a]	0.8166	0.4527	1.80[b]	0.0198	0.0094	2.38[a]
(-2,+2)	1.6104	0.6193	2.60[a]	0.6574	0.5845	1.12	0.0280	0.0136	3.60[a]

[a, b] and [c] denote statistical significance at the 1%, 5%, and10% levels, respectively, using a one-tailed test

Hypothesis *H5* predicts that event-day volatility is lower after the December 2002 stock exchange and legislative reforms. The two-sample Wilcoxon Z-statistic tests the probability that the pre-December 2002 period is more volatile than the post-December 2002 period. The Wilcoxon test results presented in Table 7.2 reveal that relative to the post-reform period, pre-reform period return volatility is no greater on the event day but statistically significantly greater on day -1. No other days show significant differences. For all event windows examined except for days (0,+1), volatility is significantly higher in the pre-reform period.

As reported in Appendix Table A7.4, the above findings are robust to the use of the alternate market measure. In Appendix Table A7.5 the Corrado rank test and Wilcoxon analyses are repeated, partitioning the daily data instead at 1 August 2003 for the 2003 RMA reform implementation. The results are similar to those presented in Table 7.2 but at reduced levels of statistical significance. This suggests that dividing the sample at December 2002 better captures any potential differences attributable to the various reforms.

From the above observations, there appears to be insufficient evidence to support the proposition that event-day volatility has declined in the post-reform period. However, there appears to be some evidence that volatility surrounding the event day has diminished subsequent to the reforms. Further evidence regarding the effect of the reforms will be presented later in this subsection with the GLS regression results.

In an attempt to gain insights into possible factors that drive excess volatility in the overall sample, the testing of hypothesis *H6* involves partitioning the sample according to the news classification as successful, uncertain or unsuccessful. As shown in Table 7.3, using the Corrado rank test, there is weak to moderate evidence of significant abnormal volatility on day -2 for the successful subsample and day 0 for the uncertain subsample. Nevertheless, as presented in Appendix Table A7.6, only the day -2 result is robust to the use of the alternate market index. This suggests that the Table 7.1 findings of event-day excess volatility are not strongly driven by any one news type, while pre-event volatility may result primarily from traders' anticipation of successful news announcements.

Table 7.3 Analysis of absolute abnormal returns by news classification

	Ranked absolute abnormal returns									Absolute abnormal returns					
	Successful n=44			Uncertain n=42			Unsuccessful n=4			Successful	Uncertain	Unsuccessful	Wilcoxon Z		
Event days	Mean	Std dev	T	Mean	Std dev	T	Mean	Std dev	T	(1) Median	(2) Median	(3) Median	(2)-(1)	(3)-(2)	(3)-(1)
-2	0.4509	0.2755	1.64[c]	0.3537	0.2862	1.24	-0.5656	0.2803	-2.02	0.0109	0.0074	0.0020	-0.31	-1.97[b]	-2.18[b]
-1	0.0304	0.2755	0.11	0.3239	0.2862	1.13	0.2172	0.2803	0.78	0.0067	0.0091	0.0116	0.55	0.88	1.06
0	0.3423	0.2755	1.24	0.4764	0.2862	1.66[b]	0.6434	0.2803	2.30	0.0091	0.0083	0.0290	0.28	2.09[b]	1.96[b]
1	-0.4013	0.2755	-1.46	0.0396	0.2862	0.14	0.1885	0.2803	0.67	0.0065	0.0064	0.0164	0.67	0.80	1.03
2	0.2319	0.2755	0.84	0.1092	0.2862	0.38	0.4590	0.2803	1.64	0.0092	0.0080	0.0400	-0.34	1.66	1.62

[a, b] and [c] denote statistical significance at the 1%, 5%, and10% levels, respectively, using a one-tailed Corrado rank T-test or two-tailed Wilcoxon Z exact test

Hypothesis *H6* predicts that the higher precision of successful and unsuccessful announcements will reduce event-induced return volatility relative to uncertain announcements. The two-sample Wilcoxon non-parametric test is employed to assess differences between the subsamples. Given that the unsuccessful subsample size is small (n=4), the asymptotic assumptions of the Wilcoxon test statistic may not be met, so a two-sample Wilcoxon exact test that does not require such asymptotic assumptions is used (SAS Institute Inc., 2004). If hypothesis *H6* is true, then the Wilcoxon Z test statistics are expected to be positive in Table 7.3 column (2)-(1), representing greater volatility in the uncertain subsample relative to the successful subsample, and negative in column (3)-(2), signifying lower volatility in the unsuccessful subsample relative to the uncertain subsample. The results reveal no significant volatility differences between the uncertain and successful subsamples. Counter to the hypothesis *H6* prediction, there is moderate evidence that return volatility for the unsuccessful subsample is significantly greater on the event day, not only relative to the uncertain subsample, but also relative to the successful subsample. Only on day -2 is there any evidence of lower volatility in the unsuccessful subsample. Appendix Table A7.6 shows that the Wilcoxon results are robust to the market index employed. The findings suggest that the news classification is not a good proxy for precision of information. However, the finding that unsuccessful resource consent news induces more event-day volatility than successful and uncertain news is consistent with Michaely, Thaler and Womack (1995) who find greater magnitude of price reactions to bad (dividend omission) news than to good (dividend initiation) news.

To provide further evidence on the information content of resource consent announcements, Table 7.4 presents the estimation results from the GLS rank regression models of absolute abnormal returns. Coefficient estimates are presented with White (1980) heteroskedasticity-consistent t-statistics reported in brackets below. Models 1 and 2 include the independent variables of key interest, being the news classification dummies *(SCSDUM, UNSCSDUM and UNCDUM),* and the reform dummy *(REFORMDUM).* The news classification results are generally consistent with the Wilcoxon findings reported in Table 7.3, which do not support the hypothesis *H6* prediction of higher event-day volatility in the uncertain subsample relative to the other subsamples. In Model 1, the uncertain subsample is omitted, with the effect being to test the incremental volatility of each of the successful and unsuccessful subsamples relative to the uncertain subsample. The Model 1 t-statistic for the estimated coefficient of *UNSCSDUM* is significantly positive at the 1% level, indicating higher volatility for unsuccessful resource consent news relative to uncertain news.

Table 7.4 GLS cross-sectional rank regression model of absolute abnormal returns, (t-statistics)

Variable	Predicted sign	AAR(0) Model 1	AAR(0) Model 2	AAR(0) Model 3	AAR(0) Model 4	AAR(0) Model 5	ACAR(-1,+1) Model 6	ACAR(-2,+2) Model 7
Constant	n/a	0.4673 (8.27)[a]	0.7668 (8.38)[a]	0.7925 (6.61)[a]	0.7941 (6.44)[a]	0.8807 (15.74)[a]	0.9119 (7.26)[a]	0.8077 (5.93)[a]
SCSDUM	-	-0.0356 (-0.59)	-0.3350 (-3.59)[a]	-0.3372 (-3.93)[a]	-0.3758 (-5.16)[a]	-0.4383 (-7.25)[a]	-0.3681 (-4.02)[a]	-0.0945 (-1.07)
UNSCSDUM	-	0.2995 (3.24)[a]						
UNCDUM	+		-0.2995 (-3.24)[a]	-0.2799 (-3.17)[a]	-0.3204 (-4.69)[a]	-0.3896 (-6.22)[a]	-0.2980 (-3.29)[a]	-0.1279 (-1.39)
REFORMDUM	−	0.0543 (0.90)	0.0543 (0.90)	0.1518 (2.42)[b]	0.0811 (1.32)		-0.0851 (-1.42)	-0.1777 (-2.67)[a]
MB	+			0.1290 (1.16)	0.1476 (1.33)		0.2345 (2.14)[b]	0.1882 (1.63)
LEV	+			-0.1006 (-1.06)	0.0409 (0.41)		-0.0647 (-0.68)	0.1043 (0.90)
MVE	−			-0.2290 (-2.30)[b]	-0.2369 (-1.64)		-0.1897 (-1.63)	-0.2923 (-2.79)[a]
MEDIADUM	+			0.1628 (2.21)[b]	0.1294 (1.88)[b]	0.1222 (1.63)		
PATDUM	+			-0.1543 (-1.71)[c]	-0.1668 (-2.15)[b]	-0.1785 -(2.72)[a]	-0.0842 (-1.06)	0.0319 (0.49)
DISCLOSDUM	n/a			-0.0262 (-0.46)	-0.0429 (-0.80)		-0.0950 (-1.80)[c]	-0.1121 (-2.02)[b]
FINCON	n/a				0.0480 (0.50)		-0.0425 (-0.46)	-0.0815 (-0.91)
UTILS	n/a				0.0506 (0.47)		0.0551 (0.53)	-0.0114 (-0.12)
OILGS	n/a				0.2099 (2.39)[b]	0.2496 (4.11)[a]	0.0630 (0.51)	-0.1731 (-1.44)
BMATR	n/a				-0.2914 (-3.12)[a]	-0.2908 (-6.58)[a]	-0.2135 (-1.81)[c]	-0.2031 (-1.63)
INDUS	n/a				-0.0144) (-0.14)		0.0355 (0.35)	-0.1043 (-1.07)
CONTAMDUM	n/a							0.1456 (1.73)[c]
Adjusted R^2		0.031	0.031	0.138	0.202	0.221	0.157	0.214

[a, b] and [c] denote statistical significance at the 1%, 5%, and10% levels, respectively, using a two-tailed test

Also counter to hypothesis *H6*, the results confirm the Table 7.3 finding of no significant difference in volatility between successful and uncertain resource consent announcements. In Model 2, *UNSCSDUM* is replaced by *UNCDUM* in order to test for differences between the unsuccessful subsample and the other two subsamples. Consistent with the Table 7.3 Wilcoxon results, the t-statistics for the coefficient estimates of *SCSCDUM* and *UNCDUM* are significantly negative at the 1% level, indicating lower volatility in these subsamples relative to the unsuccessful subsample. In both Models 1 and 2, the t-statistic for the *REFORMDUM* coefficient is insignificant, indicating no difference in volatility between the pre- and post-reform periods.

The veracity of the Model 2 results in Table 7.4 is tested in Models 3, 4 and 5. Model 3 adds additional independent variables that may influence the announcement day volatility. The results for the news classification variables remain materially unchanged, but the positive sign of the coefficient on *REFORMDUM* suggests that, counter to predictions, event-day volatility is significantly higher (at the 5% level) in the post-reform period. For the control variables, the coefficient estimate for the market value of equity (*MVE*) is statistically significant at the 5% level, and the negative sign supports the view that small firms suffer greater effects of information asymmetry (Atiase, 1985; Bailey et al., 2003). The positive sign of the statistically significant coefficient (5% level) for media coverage (*MEDIADUM*) is also consistent with prior research that suggests that the presence of media publicity is associated with increased volatility (Klibanoff et al., 1998; Mitchell & Mulherin, 1994). Counter to predictions, there is weak evidence (10% level) that patent activity (*PATDUM*) decreases event-day volatility. Model 4 includes full control variables including industry dummies. The coefficient estimates for the news classification variables remain statistically significant at the 1% level. The significant Model 3 *REFORMDUM* coefficient becomes insignificant in Model 4, suggesting that industry differences were influencing the former result. With respect to the estimated coefficients for the Model 4 control variables, *MVE* and *MEDIADUM* show diminished evidence of statistical significance while the reverse holds true for *PATDUM*, which shows stronger evidence (5% level) of reduced volatility relative to Model 3. The Model 4 coefficient estimates for the industry control variables *BMATR* and *OILGS* indicate evidence of significantly different levels (at 1% and 5%, respectively) of volatility in the basic materials and oil and gas industries relative to the healthcare industry. The model signs for the statistically insignificant control variables of market-to-book ratio (*MB*) and leverage (*LEV*) are in the direction predicted. When faced with a small sample size, a parsimonious model with fewer explanatory variables is generally preferable. Given that the inclusion of insignificant variables may otherwise

influence the results, in Model 5 only the most significant variables from Model 4 are retained. The coefficient estimates for *SCSCDUM*, *UNCDUM*, *PATDUM*, *OILGS* and *BMATR* are statistically significant at the 1% level, while that for *MEDIADUM* is not statistically significant.

To consider the persistence of the key results of interest, the event window is widened to consider absolute values of cumulative abnormal returns in the window (-1,+1) in Model 6, and the window (-2,+2) in Model 7. Key variables of interest and control variables are included in both models, although Model 7 adds an additional variable, *CONTAMDUM*, to control for the possibility that contaminating events on days -2 or +2 may have affected abnormal returns. The control variable *MEDIADUM* is dropped in Models 6 and 7 due to endogeneity issues given that media reports published on or after the announcement release date are unlikely to be responsible for pre-announcement volatility on the days -2 and -1. The t-statistics remain strongly significant for the coefficient estimates of *SCSCDUM* and *UNCDUM* in Model 6, but are insignificant in Model 7. As predicted, the coefficient on *REFORMDUM* is negative, indicating lower volatility in the post-reform period relative to the pre-reform period, but is statistically significant (1% level) only in Model 7 with the wider window (-2,+2). With respect to the control variables, the statistically significant coefficient estimates are for *MB*, *DISCLOSDUM* and *BMATR* in Model 6 and for *MVE, DISCLOSDUM* and *CONTAMDUM* in Model 7. The directions of the coefficient signs are as predicted for *MB* and *MVE*, while the significantly negative *DISCLOSDUM* coefficient indicates that non-anticipated (first) disclosures exhibit lower volatility than anticipated disclosures. This finding is consistent with the positive feedback theory (Shiller, 2003) and runs counter to suggestions of reduced information asymmetry for subsequent disclosures.

Robustness test results presented in Appendix Table A7.7 are consistent with the Model 1 observations in Table 7.4. When *UNCDUM* in Models 3 to 7 of Table 7.4 is replaced with *UNSCSCDUM* (Models 8 to 12), the coefficient for the latter remains significantly positive at the 1% level in all models except Model 12 which has the wider (-2,+2) window. The *SCSCDUM* coefficients remain statistically insignificant as found in Model 1.

Overall, most of the GLS rank regression results agree with the univariate findings of no significant difference in event-day return volatility as a consequence of the stock exchange and legislative reforms. Therefore hypothesis *H5,* that event-day return volatility from resource consent announcements is lower in the post-reform period than

in the pre-reform period, is rejected. This suggests that the legislative and stock exchange reforms failed to have any significant influence on the information content of resource consent announcements. Nevertheless, over a wider window (-2,+2), the univariate and multivariate evidence are consistent with previous research suggesting that the reforms resulted in lower return volatility (Huang et al., 2008).

With respect to the news classifications, both the univariate and multivariate results indicate that return volatility is lower for successful or uncertain resource consent announcements relative to unsuccessful announcements. The results are consistent with research that suggests that the magnitude of market reactions to negative news is greater than the reactions to positive news (Michaely et al., 1995). The findings do not support the proposal that return volatility is lower for more precise (successful and unsuccessful) announcements as opposed to less precise (uncertain) announcements, so hypothesis *H6* is rejected.

7.3 The economic impact of resource consent announcements

7.3.1 Analysis of subsample abnormal returns

Hypotheses *H7, H8* and *H9* consider the economic impact of resource consent announcements for the news classification subsamples by testing the event-day abnormal returns. The mean and median *AR* and *CAR* presented in Table 7.5 differ markedly, confirming earlier findings of non-normality of returns. Accordingly, further analyses in this chapter present median rather than mean abnormal returns, and employ non-parametric tests that are free from restrictive distributional assumptions. Standardised abnormal returns are first evaluated according to the Corrado and Zivney (1992) variance-adjusted rank test. Return volatility may be high prior to a public announcement if insiders engage in pre-event trading on private information (O. Kim & Verrecchia, 1997; McNichols & Trueman, 1994), or immediately after the event day if strategic trading by investors results in the slow incorporation of information into prices (Pritamani & Singal, 2001). Accordingly, a cross-sectional variance adjustment is made for each day within a window of (-2, +2).

Table 7.5 Analysis of ranked abnormal returns

Event days	Abnormal returns			Ranked variance-adjusted standardised abnormal returns		
	Mean	Median	Propn. pos. returns	Mean	Std dev	T
Panel A. Entire sample (n=90)						
-2	-0.0019	-0.0013	0.46	-0.1711	0.2639	-0.65
-1	0.0021	-0.0016	0.42	0.0889	0.2639	0.34
0	0.0065	0.0005	0.51	0.2695	0.2639	1.02
1	0.0043	0.0001	0.51	0.2186	0.2639	0.83
2	-0.0037	-0.0009	0.44	0.0065	0.2639	0.02
Event window						
(-1,0)	0.0086	-0.0013	0.48	0.3584	0.3733	0.96
(0,+1)	0.0108	0.0006	0.51	0.4881	0.3733	1.31
(-1,+1)	0.0129	-0.0012	0.48	0.5770	0.4572	1.26
(0,+2)	0.0070	0.0027	0.54	0.4946	0.4572	1.08
(-2,+2)	0.0072	0.0025	0.52	0.4124	0.5902	0.70
Panel B. Successful subsample (n=44)						
-2	0.0023	-0.0021	0.43	-0.0385	0.2597	-0.15
-1	0.0031	-0.0022	0.41	-0.0185	0.2597	-0.07
0	0.0102	0.0014	0.57	0.3231	0.2597	1.24
1	-0.0006	0.0003	0.55	0.0734	0.2597	0.28
2	0.0025	0.0018	0.52	0.5444	0.2597	2.10[b]
Event window						
(-1,0)	0.0134	0.0036	0.55	0.3046	0.3673	0.83
(0,+1)	0.0097	0.0015	0.55	0.3965	0.3673	1.08
(-1,+1)	0.0128	0.0005	0.50	0.3780	0.4498	0.84
(0,+2)	0.0121	0.0052	0.64	0.9409	0.4498	2.09[b]
(-2,+2)	0.0176	0.0116	0.64	0.8839	0.5807	1.52
Panel C. Uncertain subsample (n=42)						
-2	-0.0065	0.0003	0.50	-0.1434	0.2654	-0.54
-1	0.0034	-0.0006	0.45	0.1290	0.2654	0.49
0	0.0090	0.0003	0.50	0.2934	0.2654	1.11
1	0.0125	0.0016	0.52	0.3169	0.2654	1.19
2	-0.0098	-0.0033	0.36	-0.6482	0.2654	-2.44[b]
Event window						
(-1,0)	0.0124	-0.0028	0.45	0.4224	0.3754	1.13
(0,+1)	0.0215	0.0008	0.52	0.6103	0.3754	1.63
(-1,+1)	0.0249	-0.0010	0.50	0.7393	0.4597	1.61
(0,+2)	0.0118	-0.0016	0.48	-0.0378	0.4597	-0.08
(-2,+2)	0.0087	-0.0031	0.43	-0.0523	0.5935	-0.09
Panel D. Unsuccessful subsample (n=4)						
-2	-0.0011	-0.0014	0.25	-0.2869	0.2960	-0.97
-1	-0.0220	-0.0063	0.25	-0.2582	0.2960	-0.87
0	-0.0620	-0.0286	0.00	-0.6680	0.2960	-2.26
1	-0.0282	-0.0164	0.00	-0.5533	0.2960	-1.87
2	-0.0082	0.0048	0.50	0.0533	0.2960	0.18
Event window						
(-1,0)	-0.0840	-0.0233	0.00	-0.9262	0.4186	-2.21
(0,+1)	-0.0902	-0.0450	0.00	-1.2213	0.4186	-2.92[c]
(-1,+1)	-0.1122	-0.0396	0.00	-1.4795	0.5127	-2.89[c]
(0,+2)	-0.0984	-0.0306	0.25	-1.1680	0.5127	-2.28
(-2,+2)	-0.1215	-0.0283	0.25	-1.7131	0.6619	-2.59[c]

[a, b] and [c] denote statistical significance at the 1%, 5%, and10% levels, respectively, using a two-tailed test

Panel A of Table 7.5 reports no evidence of significant abnormal returns over the entire sample. This is not surprising as the full sample fails to distinguish between potentially offsetting positive and negative news. However, partitioned results in Panels B and C indicate that on day +2, abnormal returns are significantly greater than zero for the successful announcements subsample and significantly less than zero for the uncertain announcements subsample. No other days show statistically significant results. The evidence of positive abnormal returns for the successful subsample is consistent with the findings of Johnston, Sefcik and Soderstrom (2008) that the market reacts positively to signals that regulatory compliance costs are largely sunk. The results are materially unchanged when tests are repeated using the alternate market measure (Appendix Table A7.8), market-adjusted returns (Appendix Table A7.9), and market model abnormal returns without the cross-sectional variance adjustment (Appendix Table A7.10). Table 7.5 further reveals that the *CAR* are significantly different from zero in the window $(0,+2)$ for the successful subsample, and in the windows $(0,+1)$, $(-1,+1)$, and $(-2,+2)$ for the unsuccessful subsamples.

Two of the 90 announcements experience a contaminating event on day +2, so the Table 7.5 analysis for day +2 is repeated after removing these observations from the subsamples. As revealed in Table 7.6, there are no material changes to the prior observations, irrespective of whether or not a variance-correction is made .

Table 7.6 Analysis of event day +2 ranked abnormal returns excluding day +2 contaminating events

	Abnormal returns		Ranked standardised abnormal returns		
Subsample	Median	Propn.pos. returns	Mean	Std dev	T
Panel A. Variance-adjusted subsamples					
Successful (n=43)	0.0033	0.53	0.6362	0.2584	2.42[b]
Uncertain (n=41)	-0.0029	0.37	-0.6202	0.2651	-2.34[b]
Panel B. Non-variance-adjusted subsamples					
Successful (n=43)	0.0033	0.53	0.6332	0.2581	2.45[b]
Uncertain (n=41)	-0.0029	0.37	-0.5901	0.2639	-2.24[b]

[a, b] and [c] denote statistical significance at the 1%, 5%, and10% levels, respectively, using a two-tailed test

Although no hypothesis is proposed concerning possible differences between the pre- and post-December 2002 abnormal returns, for completeness, a comparison between these periods is presented in Table 7.7 using the two-sample Wilcoxon Z-statistic. No evidence of statistically significant differences between the pre- and post-reform periods is detected.

Table 7.7 Comparison of pre- and post-December 2002 standardised abnormal returns

	Subsample median standardised abnormal returns				Wilcoxon Z-statistic	
	Successful		Uncertain			
Event days	(1) Pre-December 2002 n=15	(2) Post-December 2002 n=29	(3) Pre-December 2002 n=21	(4) Post-December 2002 n=21	(1)-(2)	(3)-(4)
-2	-0.1510	-0.0485	0.0766	-0.1442	-0.62	-0.65
-1	0.2611	- 0.1668	-0.0090	-0.0566	1.49	-0.40
0	0.0400	0.1061	0.2036	-0.2642	-0.20	-1.33
1	0.0113	0.0348	0.0397	0.1215	-0.40	-0.13
2	-0.1003	0.2429	-0.2723	-0.2203	-0.12	0.40

[a, b] and [c] denote statistical significance at the 1%, 5%, and10% levels, respectively, using a two-tailed test

The above analyses do not support the propositions in hypotheses *H7* and *H8* that the event-day abnormal returns are positive for successful resource consent announcements and negative for unsuccessful announcements. However, some evidence (at the 5% level) suggests that post-event abnormal returns (on day +2) are positive following news of success, and negative following uncertain news.

Hypothesis *H9* predicts that event-day abnormal returns are lower for unsuccessful resource consent announcements than for either successful or uncertain announcements. A univariate comparison of standardised abnormal returns by news classification using the two-sample Wilcoxon test is presented in Table 7.8. The significant negative signs for the Z-statistics on each of days 0 (1% level) and +1 (5% level) provide moderate evidence that the standardised abnormal returns for unsuccessful announcements are lower than those for successful or uncertain announcements. Resource consent announcements in the uncertain news class are also found to result in significantly (1% level) lower abnormal returns than those in the successful news class, but only on event day +2. Appendix Table A7.11 shows that the above observations are robust to the choice of market index.

Table 7.8 Comparison of successful, uncertain and unsuccessful standardised abnormal returns

	Subsample median standardised abnormal returns			Wilcoxon Z-statistic		
	(1)	(2)	(3)			
Event days	Successful, n=44	Uncertain, n=42	Unsuccessful, n=4	(2)-(1)	(3)-(1)	(3)-(2)
-2	-0.1326	0.0165	-0.0560	-0.10	0.17	-0.06
-1	-0.1183	- 0.0515	-0.3003	0.17	-0.73	-0.76
0	0.0615	0.0055	-1.4823	-0.04	-2.56[a]	-2.75[a]
1	0.0192	0.0689	-0.8435	0.51	-1.96[b]	-2.09[b]
2	0.1373	-0.2463	0.2547	-3.03[a]	0.00	0.80

[a, b] and [c] denote statistical significance at the 1%, 5%, and10% levels, respectively, using a one-tailed exact test

Hypothesis *H10* suggests that contemporaneous media coverage of successful resource consent announcements may be positively associated with event-day abnormal returns. Contemporaneous media coverage is defined as the observation of at least one newspaper article pertaining to a given resource consent during the period from the stock exchange announcement release date up to and including the event date. Panel A of Table 7.9 reveals that for successful announcements, ranked variance-adjusted standardised abnormal returns are positive and statistically significant on day 0 when there is contemporaneous media coverage, and on day +5 when there is no contemporaneous media coverage. Table 7.9 also presents the univariate results of the two-sample Wilcoxon *Z*-tests to compare the standardised abnormal returns with and without contemporaneous media coverage. Consistent with the hypothesis *H10* prediction, the event-day results show significantly greater abnormal returns (at the 1% level) for successful announcements when media publicity is present than when it is absent. No other days show statistically significant differences, except on day +5 when successful announcements without contemporaneous event-day media coverage experience significantly greater abnormal returns (at the 5% level). Nevertheless, untabulated results partitioned according to media coverage over a wider window (0,+2) show evidence of significantly positive abnormal returns (5% level) arising on day +2 for successful announcements that receive media coverage. Appendix Table A7.12 reveals no material change to the Table 7.9 results when the alternate market index is employed. These findings provide evidence that the presence of media publicity is positively associated with the magnitude and speed of price reactions to successful resource consent announcements. In contrast, Panel B of Table 7.9 shows that uncertain announcements display significantly negative abnormal returns on day +2 irrespective of the presence of contemporaneous media coverage. These findings are consistent with prior research indicating that the speed of price reactions is faster for good news (e.g. Chan, 2003; Pritamani & Singal, 2001).

Table 7.9 Analysis of abnormal returns by contemporaneous media coverage

	Ranked variance-adjusted standardised abnormal returns						Abnormal returns				Standardised abnormal returns		
	With media coverage			Without media coverage			With media coverage		Without media coverage		With media coverage	Without media coverage	Wilcoxon Z
Event days	Mean	Std dev	T	Mean	Std dev	T	Median	Propn. pos. returns	Median	Propn. pos. returns	(1) Median	(2) Median	(1)-(2)
Panel A. Successful subsample													
		(n=12)			(n=32)		(n=12)		(n=32)		(n=12)	(n=32)	
0	0.6980	0.2714	2.57[b]	-0.1145	0.2553	-0.45	0.0099	0.83	-0.0017	0.47	0.6916	-0.0981	2.46[a]
1	0.0024	0.2714	0.01	0.0853	0.2553	0.33	-0.0006	0.50	0.0003	0.56	-0.0383	0.0192	-0.09
2	0.3597	0.2714	1.32	0.4094	0.2553	1.60	0.0047	0.50	0.0018	0.53	0.1494	0.1373	0.28
3	0.0071	0.2714	0.03	0.1032	0.2553	0.40	-0.0023	0.33	0.0001	0.50	-0.0605	0.0100	-0.46
4	-0.4685	0.2714	-1.73	-0.0661	0.2553	-0.26	-0.0055	0.33	-0.0010	0.47	-0.3882	-0.0670	-1.01
5	-0.1775	0.2714	-0.65	0.6204	0.2553	2.43[b]	-0.0034	0.25	0.0015	0.59	-0.1981	0.0998	-2.07[b]
Panel B. Uncertain subsample													
		(n=6)			(n=36)		(n=6)		n=36		(n=6)	(n=36)	
0	0.2312	0.2990	0.77	0.2606	0.2562	1.02	-0.0018	0.33	0.0017	0.53	-0.1476	0.0889	0.09
1	0.4886	0.2990	1.63	0.1541	0.2562	0.60	0.0136	0.67	0.0004	0.50	1.0060	0.0094	1.56
2	-0.7678	0.2990	-2.57[b]	-0.4594	0.2562	-1.79[c]	-0.0109	0.17	-0.0016	0.39	-0.6513	-0.1256	-1.06
3	-0.2349	0.2990	-0.79	-0.1600	0.2562	-0.06	-0.0031	0.17	-0.0004	0.47	-0.2242	-0.0279	-0.49
4	0.2396	0.2990	0.81	0.2290	0.2562	0.89	0.0027	0.67	0.0017	0.53	0.2198	0.0644	0.34
5	-0.1399	0.2990	-0.47	-0.0088	0.2562	-0.03	-0.0016	0.33	0.0003	0.56	-0.1244	0.0188	-0.59

[a, b] and [c] denote statistical significance at the 1%, 5%, and10% levels, respectively, using a two-tailed Corrado rank T-test or two-tailed Wilcoxon Z exact test

The results in Table 7.9 shed light on the earlier apparent implication from Table 7.5 that the market fails to react immediately to resource consent announcements. Partitioning the data according to the presence of contemporaneous media reports, it is observed that the price reaction to resource consent information is immediate for successful stock exchange announcements that are concurrently disseminated via the media. For uncertain announcements and for announcements that do not receive contemporaneous media publicity, the speed of price reaction is slower. These findings are consistent with the earlier investigation in Section 5.4.1 of Chapter 5. Trading volume around resource consent announcements is greater than average, but it is not unusually high, suggesting that some resource consent information may be absorbed gradually by market participants over several days. The results are also consistent with prior research findings that the magnitude and/or speed of price reactions is strengthened when media coverage is present (Durnev & Molchanov, 2008; Klibanoff et al., 1998; Pritamani & Singal, 2001) and that speed of price adjustment is faster for good news than for bad news (Chan, 2003; Michaely et al., 1995; Pritamani & Singal, 2001; Woodruff & Senchack, 1988).

To gather further evidence with respect to hypotheses *H9* and *H10*, Table 7.10 reports the GLS estimation results from cross-sectional rank regression models of abnormal returns. Coefficient estimates are presented with White (1980) heteroskedasticity-consistent t-statistics reported in brackets below.

Table 7.10 GLS cross-sectional rank regression model of abnormal returns, (t-statistics)

Variable	Predicted sign	AR(0) Model 1	AR(0) Model 2	AR(0) Model 3	AR(0) Model 4	AR(0) Model 5	CAR(-1,+1) Model 6	CAR(-2,+2) Model 7
Constant	n/a	0.5020 (11.48)[a]	0.0447 (0.75)	0.0705 (1.40)	-0.366 (-0.27)	0.1288 (1.48)	0.0867 (0.72)	0.3955 (1.65)
SCSDUM	+	-0.0074 (-0.13)	0.4499 (6.45)[a]	0.4045 (6.03)[a]	0.5551 (5.13)[a]	0.4738 (5.55)[a]	0.5391 (5.91)[a]	0.2536 (1.27)
UNSCSDUM	-	-0.4573 (-6.32)[a]						
UNCDUM	+		0.4573 (6.32)[a]	0.4463 (7.26)[a]	0.5533 (5.14)[a]	0.4815 (5.50)[a]	0.4958 (5.37)[a]	0.1417 (0.70)
MEDIADUM	+	0.1288 (1.80)[c]	0.1288 (1.80)[c]	0.0258 (0.23)	0.1172 (1.97)[b]	0.1226 (1.86)[c]		
SCSDUM*MEDIADUM	+			0.1731 (1.20)				
MB	+				0.1857 (1.63)		0.1942 (1.86)[c]	0.0956 (0.77)
LEV	+				0.0807 (0.74)		0.0179 (0.16)	0.0457 (0.40)
MVE	–				-0.2940 (-2.95)[a]	-0.2114 (-2.22)[b]	-0.3474 (-3.05)[a]	-0.2960 (-2.16)[b]
PATDUM	+				0.0699 (1.05)		0.0257 (0.37)	0.0929 (1.23)
FINCON	n/a				0.0755 (0.88)		0.0317 (0.39)	-0.0461 (-0.39)
UTILS	n/a				0.0457 (0.49)		0.0376 (0.38)	0.0523 (0.45)
OILGS	n/a				0.0238 (0.17)		-0.1315 (-0.97)	-0.1775 (-1.50)
BMATR	n/a				-0.1064 (-1.17)		-0.0978 (-0.86)	-0.1931 (-1.45)
INDUS	n/a				-0.1028 (-1.03)		-0.0337 (-0.31)	0.0554 (0.49)
CONTAMDUM	n/a							-0.0346 (-0.29)
Adjusted R^2		0.112	0.112	0.117	0.133	0.149	0.120	0.067

[a, b] and [c] denote statistical significance at the 1%, 5%, and10% levels, respectively, using a two-tailed test

Models 1 and 2 include the independent variables of interest, being the news classification dummies and *MEDIADUM*. The news classification results are consistent with the univariate results in Table 7.8. In Model 1, the uncertain subsample is omitted to test for differences in the event-day abnormal returns for each of the successful and unsuccessful subsamples relative to the uncertain subsample. The t-statistic for the coefficient estimate of *UNSCSCDUM* in Model 1 is significantly negative at the 1% level, indicating as predicted in hypothesis *H9* that event-day abnormal returns are lower for unsuccessful announcements than for uncertain announcements. The results also confirm the Table 7.8 finding that the event-day abnormal returns for successful and uncertain resource consent announcements are not significantly different. In Model 2, the differences between the unsuccessful subsample and the other two subsamples are tested by replacing the *UNSCSCDUM* variable by the *UNCDUM* variable. Consistent with the Table 7.8 univariate results and hypothesis *H9*, the significantly positive t-statistics at the 1% level for the *SCSCDUM* and *UNCDUM* coefficients indicate higher abnormal returns in these subsamples relative to the unsuccessful subsample. In both Models 1 and 2, the t-statistic for *MEDIADUM* is significant at the 10% level, supporting earlier evidence in Table 7.9 that contemporaneous media coverage may be positively associated with event-day abnormal returns. To consider the possibility of a differential impact of media coverage for successful news relative to other news, Model 3 adds an interaction term between *SCSCDUM* and *MEDIADUM*. Although the direction of the *SCSCDUM*MEDIADUM* coefficient is positive as forecast, the insignificant t-statistic suggests that the relationship between media coverage and event-day abnormal returns is not different between the news groups.

Models 4 and 5 extend Model 2 by adding control variables that may affect day 0 abnormal returns. In Model 4, results for the news classification and *MEDIADUM* variables remain materially unchanged, with coefficients being significantly positive at the 1% level for *SCSCDUM* and *UNCDUM* and at the 5% level for *MEDIADUM*. The significantly negative coefficient at the 1% level for *MVE* indicates higher abnormal returns for smaller firms, and is consistent with previous studies suggesting that small firms experience greater information asymmetry (Chen, 2006; Chen & Ho, 1997; E. Jones et al., 2004). The model signs for the remaining control variables of *MB*, *LEV*, and *PATDUM* are in the direction predicted but are not significantly different from zero. None of the coefficient estimates for the industry dummy variables are statistically significant. In Model 5, the insignificant control variables are dropped from the estimated equation, resulting in levels of significance for the coefficients that are unchanged at 1% for both news classification variables and slightly reduced to 10% for

MEDIADUM and 5% for *MVE*. Further robustness testing considers the influence of investors' anticipation of announcements due to pre-event, firm-specific media publicity on the results (Palepu, 1986; Shiller, 2003). Model 8 in Table A7.13 of Appendix 7 modifies Model 5 by adding a dummy variable *PREMEDIADUM* equal to 1 for firm-specific media publicity in the 14 calendar days prior to the announcement, and 0 otherwise. The coefficient on *PREMEDIADUM* is insignificant, and no material change to the Model 5 findings is observed.

Additional robustness testing of Model 5 adds the estimation period trading volume variable *VOL,* to consider the potential impact of liquidity on the results. As shown in Model 9 of Table A7.13 of Appendix 7, the coefficient on *VOL* is insignificant, implying that differences in liquidity between the sample firms are not materially affecting stock market reactions. This is consistent with the liquidity analysis results presented in Appendix 4 that indicate that the sample firms are fairly liquid.

In Table 7.10, the persistence of the results is also reviewed over a wider event window in Model 6 (-1,+1) and Model 7 (-2,+2). *MEDIADUM* is dropped in these models due to endogeneity issues because media news published on or after the stock exchange announcement release date is not likely to be responsible for day -1 and -2 abnormal returns. In Model 7, an additional dummy variable, *CONTAMDUM* is added to control for announcements contaminated by other confounding events on days -2 or +2. The t-statistics remain significant at the 1% level for the coefficient estimates of *SCSCDUM* and *UNCDUM* in the window period (-1,+1) but are insignificant in the (-2,+2) window. This suggests that the strongest market reaction is concentrated around the event date. Consistent with the other models, the coefficient for *MVE* remains significantly negative. Except for the weakly significant positive coefficient for *MB* in the (-1,+1) window, no estimated coefficients for other independent variables are statistically significant in the wider Model 6 and 7 windows.

In summary, the results of both the univariate and multivariate analyses of abnormal returns support the hypothesis *H9* proposition that event-day abnormal returns for unsuccessful resource consent announcements are lower than those for uncertain and successful announcements. This effect appears to persist in the window (-1,+1) but not in the window (-2,+2).

The univariate and regression results also provide some support for hypothesis *H10* that contemporaneous media coverage is positively associated with event-day

abnormal returns for successful announcements. The Corrado-Zivney and Wilcoxon test results directly support this hypothesis, while the regression results suggest that the influence of media coverage may extend across all news groups. Overall, the results of this analysis suggest that contemporaneous media coverage is positively related to event-day abnormal returns, possibly more so for successful announcements.

7.4 Conclusion

In this chapter, hypotheses *H4* to *H6* are tested to investigate the information content of resource consent announcements. Hypothesis *H4* predicts that volatility will be significantly increased on the day of resource consent announcements because the markets have received new, unanticipated information. According to hypothesis *H5*, such volatility is expected to be less severe in the period following stock exchange and legislative reforms due to improved informational efficiency of stock prices. Then in hypothesis *H6*, it is predicted that the greater precision of information contained in successful and unsuccessful resource consent announcements will result in lower volatility reactions for these announcements relative to uncertain announcements.

The findings support hypothesis *H4* that return volatility increases on the day of resource consent announcements, suggesting that such disclosures possess information useful to investors. Evidence presented earlier in Chapter 5 indicates that event-day trading volume is not unusually high, although it is almost 50% greater than the average over the 121-day sample period. Excess volatility prior to the announcement day is also observed, possibly due to pre-event private information gathering and trading. Taken together, the findings of abnormal volatility and abnormal returns with greater than average market volumes around the time of resource consent announcements are consistent with an explanation that such announcements are most closely followed by a segment of well-informed investors, who anticipate and react to the announcements. However, contrary to the predictions in hypotheses *H5* and *H6*, there is no evidence of reductions in event-day volatility due either to the RMA and stock exchange reforms or to more precise news. Nevertheless, both univariate and multivariate findings point to decreased volatility in the window (-2,+2) surrounding the resource consent announcements in the post-reform period.

To further investigate the economic impact of resource consent announcements, hypotheses *H7* to *H10* are tested. Event-day abnormal returns are predicted to be significantly positive for successful announcements (*H7*), significantly negative for unsuccessful announcements (*H8*) and significantly lower for unsuccessful announcements relative to successful and uncertain announcements (*H9*). Lastly, hypothesis *H10* predicts a positive relationship between the event-day abnormal returns of successful announcements and contemporaneous media coverage.

Partial support is found for the hypothesis *H7* prediction of significantly positive event-day abnormal returns for successful resource consent announcements. The positive stock market reaction suggests that such announcements signal that most of the regulatory compliance costs have already been incurred. Nevertheless, the significance and timing of the market reaction may be influenced by media coverage. When successful stock exchange announcements are accompanied by contemporaneous media coverage, the market reaction is significantly positive and immediate, but in the absence of contemporaneous media coverage, any significantly positive market reaction is delayed following the stock exchange announcement. In addition, a two-sample Wilcoxon *Z*-test confirms the hypothesis *H10* prediction that the event-day reaction to successful resource consent announcements is more positive in the presence of contemporaneous media coverage. With respect to hypothesis *H8*, although negative event-day reactions to unsuccessful resource consent announcements are documented, the finding is not statistically significant, possibly due to data limitations. When the event window is widened, some evidence of significant negative abnormal returns is found, suggesting that announcements of regulatory setbacks may signal increased future environmental compliance costs. Comparing the event-day reactions of the news subgroups, the univariate and multivariate results support the hypothesis *H9* prediction that unsuccessful resource consent news is viewed less favourably by the markets than successful or uncertain news. This is consistent with the view that market participants use the information transmitted in resource consent announcements to assess the impact of future regulatory compliance costs on the expected timing and magnitude of future project cash flows.

Chapter 8: Conclusion

8.1 Introduction

The controversies described in Chapter 2 with respect to delays and compliance costs associated with the process of gaining resource consent approval for major New Zealand capital expenditure projects have motivated the objective of this thesis, which is to investigate the capital market implications of resource consent information disclosed in New Zealand listed-company announcements. Section 8.2 reviews the two research aims formulated to achieve the thesis objective, the hypotheses tested and the major findings. Next, the contributions of the thesis and its limitations are discussed in Sections 8.3 and 8.4, respectively. Finally, Section 8.5 suggests further research to advance the understanding of topics covered in this thesis.

8.2 Review of research aims, hypotheses and major findings

8.2.1 The role of environmental regulatory delay in explaining capital market reactions to capital expenditure announcements

The research evidence pertaining to the firm-level economic effects of environmental regulation reviewed in Chapter 3 has failed to definitively endorse either the neo-classical view of net compliance costs to firms (Walley & Whitehead, 1994), or the Porter hypothesis (Porter & van der Linde, 1995) of potential net benefits. To shed light on this issue and to address criticisms that past studies have failed to control for costs of environmental regulatory delays and litigation, the first key research aim of this thesis sets out to examine the impact of environmental regulatory delay on New Zealand capital market reactions to capital expenditure announcements by New Zealand listed companies. Environmental regulatory delay, measured as the expected time to obtain resource consent approval, is argued to be an indicator of expected resource consent compliance costs. The hypotheses and conclusions in connection

with the first key research aim are summarised in Table 8.1, and discussed further below.

Table 8.1 Hypotheses and conclusions for research aim 1

Research aim 1: To examine the impact of environmental regulatory delay on New Zealand capital market reactions to capital expenditure announcements by New Zealand listed companies		
H1	*The expected time for a project to gain resource consent approval is positively related to its actual time to consent or abandon.*	*Supported*
H2	*Shareholder wealth maximisation hypothesis: The stock market reaction to capital expenditure project initiation announcements is positive.*	*Supported*
H2a	*The event-window abnormal returns are greater for projects with higher expected resource consent compliance costs.*	*Supported*
H3	*Rational expectations hypothesis: The stock market reaction to capital expenditure project initiation announcements is neutral.*	*Partially supported*
H3a	*The event-window abnormal returns are equal to zero, irrespective of the expected size of project resource consent compliance costs.*	*Not supported*

The first hypothesis proposes that an indicator of expected resource consent compliance costs, the expected time for a new capital expenditure project to gain resource consent approval (*ETCDUM*), is positively related to its actual time to gain consent approval or abandon the project. Using generalised least squares cross-sectional regression analysis, the *ETCDUM* variable is found to have statistically significant power to explain the actual time to gain consent approval or abandon new projects, indicating support for hypothesis *H1*. *ETCDUM* is then used as an indicator of expected resource consent compliance costs in the testing of the following hypotheses in connection with the first research aim.

In hypotheses *H2* through to *H3a*, stock market reactions to project initiation announcements are examined in order to assess the impact of expected resource consent compliance costs on the shareholder wealth effects of capital expenditure announcements. The shareholder wealth maximisation hypothesis *(H2)* predicts that the stock market reacts positively to new project announcements because managers undertake strategic investments that have positive expected NPVs. The corollary prediction *(H2a)* suggests that event-window abnormal returns are greater for projects with higher expected resource consent compliance costs because the strategic benefits associated with high compliance costs exceed the expected costs of compliance. In contrast, the rational expectations hypothesis predicts that project announcement abnormal returns are equal to zero *(H3)* and are unaffected by expected resource consent costs *(H3a)* because competitive conditions drive abnormal returns to zero.

Using event study methodology, evidence is presented in support of the shareholder wealth maximisation hypothesis *H2*, finding that overall, the stock market positively values news of capital expenditure projects. These findings are generally consistent with prior studies of capital expenditure announcements (e.g. Chen & Ho, 1997; Woolridge & Snow, 1990). Accordingly, hypothesis *H2* is accepted. In support of hypothesis *H2a* and counter to hypothesis *H3a*, further event study and cross-sectional regression results reveal that the positive valuation is driven by those project announcements for which the expected time to gain consent approval is long. For an average firm (with an average market value of equity of $1,189.3 million) that undertakes a long time to consent project, the net benefit expressed in 2007 dollars is estimated to be in the range of $18.0 to $23.4 million dollars. Based upon prior research, the time delays for resource consent approval and high level of compliance costs incurred are suggested to allow firms to develop specialised capabilities (e.g. Bernardo & Chowdhry, 2002; Hart, 1995; Nehrt, 1996) and/or to deter industry competitors and new entrants (e.g. Helland & Matsuno, 2003), thereby generating economic profits. These findings allow the acceptance of hypothesis *H2a* and the rejection of hypothesis *H3a.* In contrast, consistent with the rational expectations hypothesis *H3*, capital expenditure announcements for which expected consent processing time is short generate a neutral stock market reaction. For these projects, shorter consenting times and lower compliance costs may not give firms sufficient opportunities to develop specialised capabilities or to impose barriers to entry, thereby driving expected projects' NPVs to zero. Accordingly, partial support is found for hypothesis *H3*.

To conclude with respect to the first research aim of this thesis, regulatory delays associated with the resource consent process for New Zealand listed company capital expenditures are found to have a significant economic impact. Longer delays imply higher environmental compliance costs that allow firms the opportunity to earn greater economic rents as measured by the capital market response to project initiation announcements. These findings are consistent with the Porter hypothesis (Porter & van der Linde, 1995), and based on the related literature, long delays and higher compliance costs associated with the resource consent process are conjectured to allow firms to create sustainable competitive advantages.

8.2.2 The capital market impact of resource consent announcements

The literature reviewed in Chapters 2 and 3 suggests that the disclosure of firm-specific information plays an important role in reducing investors' costs of information acquisition, enhancing the accuracy of investors' predictions and reducing asymmetry in performance expectations (Diamond, 1985; M. H. Lang & Lundholm, 1996). As discussed in Chapter 3, research attention to firm-specific environmental disclosures has shed light on the importance of this information to investors. Yet, despite the criticisms raised in Chapter 2 of excessive delays and compliance costs in connection with obtaining resource consents, the only timely, widely-available resource consent information is transmitted via the stock exchange and media. Nevertheless, the nature of such information tends to be largely non-financial, most commonly reporting resource consent progress and a description of the project(s). Given the lack of detailed, quantitative information available to investors, the usefulness of these disseminations in assisting investors to assess the project cash flow and risk consequences appears uncertain. Yet to-date, no research evidence exists of the relevance to investors of resource consent information conveyed in announcements by New Zealand listed companies. Accordingly, the second key research aim of this thesis is to investigate the New Zealand capital market impact of resource consent announcements by New Zealand listed companies. Table 8.2 summarises the hypotheses and conclusions associated with the second research aim.

Table 8.2 Hypotheses and conclusions for research aim 2

Research aim 2: To investigate the New Zealand capital market impact of resource consent announcements by New Zealand listed companies		
H4	*The event-day absolute abnormal returns of resource consent announcements are significantly greater than zero.*	*Supported*
H5	*The event-day absolute abnormal returns of resource consent announcements in the post-reform period are lower than those in the pre-reform period.*	*Not supported*
H6	*The event-day absolute abnormal returns of successful and unsuccessful resource consent announcements are lower than those of uncertain announcements.*	*Not supported*
H7	*The event-day abnormal returns of successful resource consent announcements are significantly greater than zero.*	*Partially supported*
H8	*The event-day abnormal returns of unsuccessful resource consent announcements are significantly less than zero.*	*Not supported*
H9	*The event-day abnormal returns of unsuccessful resource consent announcements are significantly lower than those from successful or uncertain announcements.*	*Supported*
H10	*The event-day abnormal returns of successful resource consent announcements that receive contemporaneous media coverage are significantly higher than those that do not receive contemporaneous media coverage.*	*Supported*

Hypotheses *H4* to *H6* consider the information content of resource consent announcements. If as proposed in hypothesis *H4*, resource consent announcements convey new, unanticipated information to the markets, then there should be evidence of significant volatility (measured by absolute abnormal returns) on the event day. Event study results indicate evidence of abnormal return volatility not only as predicted on the event day, but also two days prior. The findings permit the acceptance of hypothesis *H4* and the conclusion that on average, the information conveyed in resource consent announcements is important to investors. Hypothesis *H5* next suggests that informational efficiency of stock prices may have improved due to stock exchange and RMA legislative reforms, thereby decreasing event-day volatility in the post-reform period. Event study, univariate and multivariate test results do not support this hypothesis, although some evidence of post-reform decreased volatility is found in the wider event window (-2,+2). Accordingly, hypothesis *H5* is rejected. Next, the sample is divided by classifying announcements according to their communication of successful, unsuccessful or uncertain resource consent information. Hypothesis *H6* proposes that the greater precision of successful and unsuccessful resource consent announcements will result in reduced event-day volatility relative to uncertain announcements. Neither the event study, univariate nor multivariate evidence presented in this thesis support this hypothesis. Accordingly, the news classification

does not appear to reflect the degree of precision of information conveyed, and hypothesis *H6* is rejected.

Hypotheses *H7* to *H10* investigate the economic impact of resource consent announcements. Hypotheses *H7* and *H8* propose that event-day stock market reactions will be significantly positive for successful announcements and significantly negative for unsuccessful announcements. Partial support is found for hypothesis *H7* from evidence presented of significant positive market reactions on the event day when media coverage is present. In contrast, while negative market reactions on the event day are documented for unsuccessful announcements, the results are not statistically significant, and accordingly, hypothesis *H8* is rejected. Hypothesis *H9* predicts that event-day abnormal returns will be significantly lower for unsuccessful announcements relative to either successful or uncertain announcements. All event study, univariate and multivariate results consistently support hypothesis *H9*. Lastly, hypothesis *H10* proposes that event-day abnormal returns will be significantly greater for successful resource consent announcements that receive contemporaneous media coverage. Univariate tests indicate support for this hypothesis, while the multivariate results suggest that the media effect may extend across all news classifications. Accordingly, hypothesis *H10* is accepted.

Considered together, the results relating to the second research aim of this thesis indicate that investors find resource consent information to be valuable, notwithstanding its overwhelmingly qualitative nature. The evidence presented is consistent with the suggestion that resource consent announcements play an economically valuable role in reducing information asymmetry by providing timely information to the market that is not available from other sources such as environmental and annual reports. Investors may use resource consent announcements to assess the stage of resource consent progress, which has important implications regarding future compliance costs that will affect the expected timing and magnitude of cash flows from related investment projects. Resource consent disclosures may also signal to the market the robustness of a firm's environmental risk management system and the potential for environmental contingent liabilities.

8.3 Contributions of the thesis

This thesis makes several useful contributions to the corporate finance and environmental economics literature, as well as having important implications for businesses and regulators. These contributions are discussed below.

This thesis adds to the academic finance literature by applying event study methodology in connection with a small stock exchange. Frequently, finance academics have shied away from small-sample research in favour of large data sets (such as from the US) that allow the use of conventional parametric statistics and restrictive sampling techniques. Yet, research results from large economies are not necessarily able to be generalised to smaller economies such as New Zealand, particularly when industrial structure and regulatory differences exist. The methodological approach followed in this thesis, including the development of equal-weighted market indices and the use of robust, non-parametric statistics such as the Corrado and Zivney (1992) variance-adjusted rank test, may help to encourage other finance researchers to engage in small-economy capital markets research.

Another key contribution of this thesis is the development of a measure of expected regulatory delay as an indicator of environmental compliance costs. The qualitative analysis presented in this thesis indicates that most resource consent compliance costs arise as a consequence of the delays associated with the system of consent approval. Accordingly, the novel approach is taken to use management forecasts and historical firm-level information to measure expected regulatory delay, being an indicator of environmental compliance costs. Other researchers may wish to apply these techniques to other jurisdictions. Furthermore, compared with compliance cost surveys that only measure costs, the thesis focus on capital expenditure announcements has the advantage of allowing insights into net benefits at the project-level.

Importantly, this study also directly addresses the criticism by Jaffe, Peterson, Portney and Stavins (1995) in their literature review of the economic impacts of environmental regulation, that most studies fail to control for costs of delays and litigation caused by environmental regulation. This thesis documents that regulatory delays associated with listed company capital expenditure decisions have a positive economic impact. In contrast to many of the past environmental compliance cost studies that focus only upon single industries, this thesis suggests that the benefits arise across a wide range of capital-intensive industries. The findings also imply that if New Zealand legislators

are able to reduce environmental regulatory delays associated with capital expenditures through further enhancements to the RMA legislation, then the opportunity for listed companies to earn economic profits may be diminished.

Furthermore, this thesis provides useful insights into the on-going debate in the academic literature regarding the economic effects of environmental regulation. Highlighting the two contrasting perspectives regarding environmental compliance costs are the neo-classical view of net costs to firms (Walley & Whitehead, 1994), and the Porter hypothesis (Porter & van der Linde, 1995) of potential net benefits. Contrary to the negative attention that resource consent processes have gained, this thesis provides evidence of a positive valuation impact of environmental compliance costs that supports previous research suggesting that the wealth of regulated firms may increase when environmental regulations assign property rights to real assets (e.g. Maloney & McCormick, 1982). The findings in this thesis are consistent with the view that firms may gain first-mover advantages from resource consents through restrictions on the use of common resources (i.e. air, land and water). Consistent with the Porter hypothesis (Porter & van der Linde, 1995), the thesis results imply that environmental compliance costs may have the effect of enhancing the competitive position of those firms that undertake major capital expenditures.

A review of prior literature suggests that this study is the first to investigate the capital market impact of New Zealand resource consent information. In doing so, this thesis adds to the growing international literature on the role of environmental disclosures in disseminating information, presenting evidence that resource consent announcements play an economically valuable role in reducing information asymmetry by providing timely, new information to the market. The valuation impact of resource consent announcements by New Zealand listed companies is found to be positive for news of successes, when regulatory compliance costs are largely sunk. In contrast, resource consent announcements of setbacks imply an increase in expected compliance costs, and are viewed negatively by the market relative to other resource consent announcements. Furthermore, the evidence presented suggests that media dissemination plays an important role in the price-adjustment process for news of resource consent successes. These findings imply that managers' communications of resource consent progress through the stock exchange and media may improve the informational efficiency of stock prices, which enhances the efficient functioning of the

for firms, the results of this research imply that it will become increasingly important for

managers to make timely disclosures of their environmental risk management strategies and processes through stock exchange and press releases. In particular, the dissemination of more quantitative information to reduce the uncertainties surrounding resource consent announcements may be prudent.

8.4 Limitations of the thesis

The research design in this thesis attempts to minimise some of the problems of data limitations associated with studying the relatively small New Zealand capital market. Nevertheless, some problems are not able to be eliminated, and these are presented as limitations of the thesis.

The sample sizes for the studies in this thesis are small. The total sample sizes are 55 and 90 for the project initiation and resource consent announcement samples, respectively. Accordingly, subsample analyses are conducted with even smaller groups. Although the non-parametric tests used for the thesis analyses are robust to small sample sizes, the small sample sizes hamper the analysis of the cross-sectional regression models as all control variables cannot be incorporated simultaneously into the cross-sectional regression models. To mitigate such problems, control variables are added to the models consecutively.

The findings reported in this thesis relate to a small economy, so the results may be different when applied to larger markets. For example, the degree of existing competition within a market may influence the ability of firms to sustain an enduring benefit from their capital expenditure projects. Nevertheless, most of the environmental regulation research discussed in Chapter 2 originates from the US, suggesting anti-competitive effects and barriers to entry also persist in large economies.

For the study of environmental regulatory delay in connection with capital expenditure decisions, the results can be interpreted to be consistent with the view that firms are able to gain a competitive advantage through a strategy of pursuing capital expenditures that require lengthy environmental compliance processes in order to proceed. Nevertheless, there may be alternative explanations. For example, the expected useful life of a project could influence the results if investors have a preference for short-term returns as suggested by the institutional investor hypothesis proposed by Woolridge and Snow (1990). Lack of information on investment durations

for capital expenditure announcements precludes this as a control variable in this thesis. However, given that previous research evidence concludes that investment duration is not a significant variable influencing capital market reactions to capital expenditure announcements (Burton et al., 1999; Woolridge & Snow, 1990), this potential explanation for the findings does not appear to be compelling. Another potential factor that could influence the results is the relative probability of gaining resource consent approval for each project. If for example, a lower probability of gaining consent approval enhances firms' abilities to develop competitive advantages, then any difference in the average expected probability of approval between the two *ETCDUM* groups could affect the interpretation of the results. In each *ETCDUM* group in this study, there is one project that was abandoned without consent approval and one project for which approval could not be confirmed. Accordingly, there is no evidence to suggest that the probability of consent approval differs between the groups. In the larger group of 128 capital expenditure projects initially identified, the probability of gaining consent approval also appears to be high. Four projects are identified as being abandoned without consent approval, no record of a consent decision can be found for another five projects, and another four projects were sold with no record found of a consent decision, implying a consent approval rate of between 89.8% - 96.9%. Given that actual consent approval is relatively high overall and is identical between the *ETCDUM* groups, the probability of consent approval appears unlikely to have materially affected the results. Nevertheless, the possibility cannot be entirely ruled out that investment horizon and/or the probability of resource consent approval are important explanatory variables influencing the results.

In this study of the capital market impact of resource consent announcements, non-parametric statistics are employed to avoid the problem that the data seriously violate the normality assumptions of parametric tests. However, the use of transformed variables impedes the economic interpretation of the results. Consequently, while this study allows statistically sound conclusions with respect to the direction of coefficient signs (and hence results) as positive or negative, the dollar value implications of good, bad and uncertain resource consent announcements cannot be fully explored. Fortunately, the non-normality of the data is less severe for the study of regulatory delay for capital expenditure projects, allowing the use of both parametric and non-parametric tests and fuller economic interpretations of the results.

8.5 Future research

New Zealand capital markets research provides important information for academics, businesses and regulators, but as discussed above, presents econometric challenges to deal with the small sample sizes. An international comparative study of consent/permit processes across different regulatory jurisdictions would provide a useful next step in helping to understand the impact of environmental regulation on business capital expenditure decisions.

This thesis finds a positive valuation impact of the expected time to gain resource consent approval on project initiation announcements. The past literature provides possible explanations for such findings. Further research could examine the effect of environmental regulation on new firm entries, firm exits and relative firm competitiveness within an industry (Millimet, Roy, & Sengupta, 2009). In the New Zealand context, researchers could investigate the impact of resource consent compliance costs on the degree of market concentration within an industry, considering how the resource consent process affects the number of firms in each industry and their relative market shares. Initial investigations need to consider whether it is possible to measure market concentration with sufficient precision to make this a feasible research endeavour. Another potential research direction could test Hart's (1995) natural resource-based theory of the development of valuable internal capabilities. This may entail interviews with business managers to gain insights into potential sources of strategic advantages gained through firm management of resource consent processes.

Finally, researchers could shed further light on the apparent discrepancy between the negative publicity that resource consent processes have attracted and the findings in this thesis that firms undertaking capital expenditure projects may gain net advantages from regulatory delays. Considering the motivations of news announcers, Dye (2001) suggests that managers may disclose the realisation of less-than-expected profits to deter new industry entrants and eliminate proprietary costs. So for example, by publicising the high costs of obtaining resource consents, resource consent holders may deter prospective competitors in the industry. Alternatively, in her Ph.D. dissertation, Zhang (2005) finds evidence to support the view that firms with high proprietary costs use lower quality disclosures to avoid revealing useful information to competitors. Resource consent announcements may provide researchers with opportunities to empirically test some of these suggestions.

Appendices

Appendix 1: Legislation encompassing the Resource Management Act 1991

Resource Management Act 1991, No 69 (1991)
Resource Management Amendment Act 1993, No 65 (1993)
Resource Management Amendment Act 1994, No 105 (1994)
Resource Management Amendment Act 1994, No 139 (1994)
Resource Management Amendment Act 1996, No 160 (1996)
Resource Management Amendment Act 1997, No 104 (1997)
Resource Management (Aquaculture Moratorium) Amendment Act 2002, No 5 (2002)
Resource Management Amendment Act 2003, No 23 (2003)
Resource Management (Aquaculture Moratorium Extension) Amendment Act 2004, No 5 (2004)
Resource Management Amendment Act 2004, No 46 (2004)
Resource Management (Energy and Climate Change) Amendment Act 2004, No 2 (2004)
Resource Management (Waitaki Catchment) Amendment Act 2004, No 77 (2004)
Resource Management (Foreshore and Seabed) Amendment Act 2004, No 94 (2004)
Resource Management Amendment Act (No 2) 2004, No 103 (2004)
Resource Management Amendment Act 2005, No 87 (2005)
Resource Management Amendment Act 2007, No 77 (2007)
Resource Management (Simplifying and Streamlining) Amendment Act 2009, No 31 (2009)

Appendix 2: Project initiation sample announcements

The project initiation announcement sample is comprised of the following 55 New Zealand listed company capital expenditure project initiation announcements from August 1992 to July 2007, obtained from the NZX i-Search, IRG Deep Archive, Newztext Plus and Factiva databases. Event dates are adjusted to the next working day for announcements after market close. For 46 of the 55 announcements, sufficient information is available to allow the construction of a composite measure to estimate the expected time (in months) to gain resource consent approval (*ETC*).

Company	Event date	ETC	Event
AFFCO Holdings	29/12/2003	0.0	Awarua meat works development
Calan Healthcare	19/10/2005	5.8	Ascot Central office complex development
Carter Holt Harvey	2/06/1998	12.0	New veneer lumber plant
Colonial Motor	31/08/1992		Te Aro site retail development
Contact Energy	30/12/1999	0.0	Purchase of geothermal power station with resource consents
Contact Energy	20/08/2004	17.1	Seeks resource consents for additional hydro generation at Hawea Gates
Contact Energy	4/10/2006	42.0	Resource consent process to be started for possible LNG terminal at Port Taranaki
Contact Energy	31/07/2007	29.4	Resource consent filed for new Te Mihi geothermal power station
Enerco	24/12/1997	33.8	Plan for Kauhauroa well drilling
Fl Challenge	14/09/1995	0.0	Purchase of Stratford power station with resource consents
Fl Challenge Energy	14/07/1997	5.0	Resource consents filed for proposed retail energy distribution
Force	22/04/1997	4.0	Auckland cinema development
Horizon Energy	20/08/1996		Proposal for Kapuni cogeneration plant
Infratil	28/05/2002	30.0	Lyall Bay shopping centre development
Infratil	5/05/2003	36.0	Wairau hydro power development
Infratil	16/12/2004	5.3	Stage 3 Tararua windfarm expansion
ING Medical Properties	11/10/2005	2.0	Ascot Hospital expansion
Kiwi Income Property Trust	8/04/1994		North City Plaza development
Kiwi Income Property Trust	9/06/1995		Sylvia Park town centre development
Macraes Mining	8/10/1992		Eastern Otago prospect gold mine
Macraes Mining	3/06/1993	24.0	Globe-Progress prospect mine

Appendix 2 *(continued)*

Company	Event date	ETC	Event
Metlifecare	16/12/1997	72.0	Development of Pinesong Retirement Village
Metlifecare	22/04/2002	11.0	Bayswater Retirement Village expansion
Metlifecare	18/03/2003	9.0	Takapuna retirement village development
New Zealand Oil and Gas	17/04/1996	18.0	Pike coal mine development
New Zealand Refining	9/03/1998	12.0	Kumeu pump station and Auckland pipeline upgrade
NGC Holdings	26/05/1993		Gas works trial
NGC Holdings	26/05/1997	10.0	Expansion of Auckland-Huntly pipeline system
NGC Holdings	1/06/2001	6.8	Plan for second gas-fired power station at Stratford
NGC Holdings	18/02/2004	6.0	Plan to replace damaged pipeline
Northland Port	26/08/2002	86.1	Proposal for barging of logs
Northland Port	25/09/2002	86.1	Development of third berth at Marsden Point port
Port of Tauranga	11/05/2000	0.0	Marsden Point deepwater port
Port of Tauranga	25/09/2002	86.1	Development of third berth at Marsden Point port
Ports of Auckland	24/10/1995	6.0	Add third berth at Fergusson Container Terminal
Ports of Auckland	1/12/2000	12.9	Plan to deepen Rangitoto shipping lane
Ports of Auckland	1/08/2003	7.0	Terminal expansion
Ryman Healthcare	26/07/2004	11.7	Expansion of Shona McFarlane Retirement Village
Ryman Healthcare	23/11/2005	11.3	Development of Palmerston North retirement Village
Ryman Healthcare	7/04/2006	11.3	Development of New Plymouth retirement village
Smiths City	18/08/2005	4.0	Plan for retail premises in Dunedin
St Lukes Group	2/06/1995	24.0	Expansion of Glenfield Mall
St Lukes Group	2/11/1999	24.0	Development of Newmarket site
Trans Tasman Properties	1/06/2000	0.0	Shortland Street Tower development
Trans Tasman Properties	7/06/2000		Western Viaduct Harbour redevelopment
Trans Tasman Properties	7/07/2004	0.0	Purchase of Halsey St. development property with resource consent
Trans Tasman Properties	28/07/2006	7.0	Queenstown commercial development
TrustPower	8/08/1996	3.0	Development of geothermal resource
TrustPower	29/04/1998	0.0	Purchase of Coleridge power station with resource consent
TrustPower	20/11/2000	0.0	Tararua wind farm stage 2 development
TrustPower	5/05/2003	36.0	Wairau hydro power project
TrustPower	16/12/2004	13.8	Stage 3 expansion of Taraua wind farm
TrustPower	9/01/2006	15.1	Lake Mahinerangi wind farm development
Wairarapa Electricity	5/11/1993		Wind powered electricity generation development
Waste Management	21/07/2000		Purchase of Kate Valley site for landfill proposal

Appendix 3: Resource consent sample announcements

The resource consent announcement sample is comprised of the following 90 New Zealand listed company resource consent announcements from May 1993 to June 2007, obtained from the NZX i-Search and IRG Deep Archive data bases. Event dates are adjusted to the next working day for announcements after market close. Announcements are classified as successful (news class=1, n=44), uncertain (news class=2, n=42) or unsuccessful (news class=3, n=4).

Company	Event date	News class	Event
AMP NZ Office Trust	8/02/2001	1	Sale of Wellington Park Royal closer with subdivision resource consent approved
Contact Energy	20/03/2003	2	Applied for a new resource consent to allow dual fuel operation at New Plymouth
Contact Energy	21/07/2003	2	Contact to clean up Waikato River discharges once resource consent renewal is finalised
Contact Energy	19/09/2003	1	Clutha hydro generation resource consent granted for 35 year period
Contact Energy	8/10/2003	1	Contact Energy indicates it generally accepts Clutha resource consent conditions
Contact Energy	10/10/2003	1	Wairakei binary plant has all required resource consents for operation
Contact Energy	20/08/2004	2	Seeks resource consents for additional hydro generation at Hawea Gates
Contact Energy	15/10/2004	1	All Wairakei consents, with one minor exception, granted for full term requested
Contact Energy	22/07/2005	2	Clutha catchment Environment Court resource consent decision to be reviewed
Contact Energy	2/09/2005	2	Contact Energy volunteers compensation regime to secure Clutha resource consent
Contact Energy	4/10/2006	2	Resource consent process to be started for possible LNG terminal at Port Taranaki
Contact Energy	21/05/2007	1	Environment Court confirms Wairakei and Poihipi geothermal power station resource consents
Contact Energy	28/05/2007	1	Environment Court confirms Clutha resource consents for 35 years
Enerco (Qest)	2/11/1995	2	Formal resource consent to be lodged for North Harbour natural gas pipeline
Enerco (Qest)	12/02/1998	1	Wholly owned subsidiary of Enerco receives Kauhauroa well resource consents
Fl Challenge Energy	20/11/1997	2	Resource consent process well advanced for FLC Energy to enter petrol distribution
Heritage Gold NZ	17/03/1994	2	Resource consent applications lodged for use of water for drilling operations

Appendix 3 *(continued)*

Company	Event date	News class	Event
Hirequip	25/09/2003	1	Environment Court upholds decision to grant Clifford Bay coastal permits
Infratil	5/11/2002	1	Land use consent granted to construct and operate retail centre at Wellington Airport
Kiwi Income Property Trust	18/06/1996	1	Resource consent granted and work commenced on North City Plaza extension
Kiwi Income Property Trust	16/07/2004	2	KIP lodges resource consent for Sylvia Park town centre development
Kiwi Income Property Trust	29/09/2004	1	Resource consent for first stage of Sylvia Park town centre development received from Auckland City Council
Lyttelton Port	16/04/2004	2	Completion of Lyttelton Port coal upgrade facility comes with greater resource consent responsibilities
Macraes Mining	13/09/1994	1	Councils recommend approval of consents required for Globe-Progress mine development
Macraes Mining	10/10/1994	2	Applied for resource consents to discharge treated water from Globe-Progress mine project
Macraes Mining	12/10/1994	3	Objector lodged appeal against regional council Globe-Progress mine consent decision
Macraes Mining	7/02/1995	2	Appeals against granting of resource consents withdrawn but further appeals lodged
Macraes Mining	13/02/1995	2	Media report over resource consents is misleading as no settlement has been entered into
Metlifecare	18/03/2003	2	Purchase of Takapuna site conditional upon obtaining resource consent for development
Metlifecare	12/11/2003	1	Resource consent granted for Metlifecare Remuera luxury retirement complex
Metlifecare	25/11/2003	3	Appeal lodged against the resource consent granted for Metlifecare Remuera project
Metlifecare	15/07/2004	2	Environment Court ruled that Remuera development may proceed subject to modifications
Metlifecare	4/10/2004	2	Extension of conditional sale agreement to allow for completion of resource consent process
Metlifecare	8/11/2004	1	Sale agreement unconditional following expiry of period for lodging appeals to resource consent for retirement village development
Metlifecare	1/07/2005	1	Granted resource consent for construction of final stage Pinesong development
New Zealand Oil and Gas	26/05/2003	1	New resource consents granted for Pike River coalfield development
New Zealand Oil and Gas	13/12/2004	2	Assessment of Environmental Effects completed as part of seeking resource consents for Kupe project
New Zealand Oil and Gas	1/04/2005	2	Kupe Joint Venture application for resource consent to be considered by district and regional councils in early and mid-April 2005
New Zealand Oil and Gas	2/12/2005	1	Grey District Council grants consent to allow NZOG subsidiary Pike River Coal to truck coal
New Zealand Oil and Gas	19/12/2006	1	NZOG subsidiary Pike River Coal granted resource consent by Environment Court to truck coal

Appendix 3 *(continued)*

Company	Event date	News class	Event
New Zealand Oil and Gas	30/05/2007	1	Pike River Coal receives Environment Court final resource consent decision confirming conditions of 12/06 interim decision to allow coal transport
New Zealand Refining	8/03/2004	1	Resource consent granted by district council for new pumping station near Huapai
NGC Holdings	26/05/1993	2	Application to be lodged with district council for gas works trial resource consents
NGC Holdings	13/04/2004	1	Resource consents received to construct gas transmission pipeline across Pohangina River
Northland Port	5/06/1996	2	Applications filed for resource consents to build a deepwater wharf at Marsden Point
Northland Port	15/12/1997	1	Resource consents approved for Marsden Point deepwater port project
Northland Port	14/09/2000	1	Joint venture to purchase assets including resource consents from NPC to undertake Marsden Point deepwater port project
Northland Port	21/01/2005	1	Minister of Conservation approves restricted coastal permits to allow marine village joint venture
Nuplex Industries	4/03/2004	1	East Tamaki waste management facility receives resource consent for air discharges
Oceana Gold	30/06/2004	1	Resource consents obtained for the redevelopment of the Blackwater underground mine
Pacific Capital Assets	23/04/1998	2	Environment Court date set for Auckland City Council appeal for Britomart project resource consent
Port of Tauranga	14/09/2000	1	Joint venture to purchase assets including resource consents from NPC to undertake Marsden Point deepwater port project
Ports of Auckland	24/10/1995	2	Ports of Auckland to seek resource consents for third berth at Fergusson Container Terminal
Ports of Auckland	19/11/1996	1	Resource consent for second option for extension of Fergusson Terminal approved
Ports of Auckland	1/12/2000	2	Public consultation to begin in preparation for lodging resource consent application for deepening shipping lane
Ports of Auckland	5/04/2002	1	Appeal against council recommendation for channel deepening resource consent is settled
Ports of Auckland	23/04/2002	1	Minister of Conservation grants resource consent for deepening shipping lane
Ports of Auckland	5/08/2003	2	POA seeks up to 10-year extension to 2006 lapsing date for terminal expansion resource consents
Ryman Healthcare	30/11/1999	2	Conditional purchase of Remuera site for retirement village development is subject to resource consent approval
Ryman Healthcare	18/09/2001	2	Resource consent application for Remuera retirement village development referred to mediation
Ryman Healthcare	10/04/2003	1	Environment Court gives approval for Remuera retirement village development
Ryman Healthcare	23/11/2005	2	Resource consent to be sought early next year for retirement village in Palmerston North

Appendix 3 *(continued)*

Company	Event date	News class	Event
Ryman Healthcare	7/04/2006	2	Hope to lodge resource consent for New Plymouth retirement village in next few months
Savoy Equities	8/06/1998	2	Britomart project to be developed by Pacific Capital once resource consents obtained
Savoy Equities	16/03/1999	1	Britomart developer receives resource consent from Environment Court
Savoy Equities	29/03/1999	2	Council extends deadline for satisfying remaining Britomart resource consent requirements
Savoy Equities	10/05/1999	2	Britomart environmental resource consent issued and draft contingency and monitoring plan ordered by Environment Court; extensions requested for historic building demolition consents
Savoy Equities	3/11/1999	3	Auckland City Council terminates Britomart project after not providing the required resource consents
Southern Capital	17/11/2000	1	Marlborough District Council recommends grant of coastal permit for Clifford Bay mussel farm
Southern Capital	20/07/2001	2	Although the Marlborough District Council coastal permit decision was appealed, SCL is confident that concerns can be alleviated and permits issued
St Lukes Group	2/11/1999	2	St Lukes Group portfolio manager and developer will lodge a resource consent application shortly for Newmarket shopping centre development
TranZ Rail	25/09/1996	2	No decision to be made on relocation of ferry terminal until resource consent process completed
TranZ Rail	15/11/1999	1	Environment Court has issued resource consents for new Clifford Bay ferry terminal
Trans Tasman Properties	7/07/2004	1	TTP announces purchase of Viaduct Harbour property with resource consent for development
TrustPower	8/08/1996	2	Geothermal production resource consent sought by joint venture company
TrustPower	15/05/2003	1	Resource consents for Tararua wind farm expansion are already in place
TrustPower	19/01/2004	1	Environment Court confirms Waipori power generation resource consent conditions for next 35 years
TrustPower	23/12/2004	2	Lodged resource consent application with councils for new Tararua wind farm
TrustPower	5/07/2005	2	Resource consent granted for 31 of 40 turbines sought for Tararua wind farm; viability of project to be reviewed by TrustPower
TrustPower	15/08/2005	1	Deep Stream enhancement of Waipori power scheme granted resource consent last month
TrustPower	9/01/2006	2	Expects to apply for resource consents for Mahinerangi wind farm near Dunedin later this year
TrustPower	29/09/2006	2	Changes planned to Mahinerangi wind farm project and revised resource consents to be submitted
TrustPower	22/06/2007	2	After significant downsizing of proposal, interim decision issued to grant resource consent for proposed Wairau Valley hydro scheme
Urbus	17/11/2004	1	Now have resource consent for redevelopment of Waitakere Plaza

Appendix 3 *(continued)*

Company	Event date	News class	Event
Wairarapa Electricity	13/09/1994	2	Will start process of securing resource consents for wind powered electricity generation scheme
Wairarapa Electricity	3/07/1995	1	Resource consents granted for southern Wairarapa wind farm
Warehouse Group	24/10/2003	3	Received notice of application for interim enforcement order to prohibit new Whangarei retail store retail activity
Warehouse Group	31/10/2003	1	Successfully opposed granting of application for interim enforcement order to prohibit new Whangarei store retail activity
Waste Management NZ	22/04/2003	1	Environment Canterbury grants all resource consent applications for Kate Valley landfill
Waste Management NZ	24/03/2004	1	Environment Court confirms granting of all resource consents for Kate Valley landfill

Appendix 4: Liquidity analysis of resource consent sample and market index stocks

Given the potential problems caused by illiquidity as noted earlier, the liquidity profile of the resource consent announcers' sample is assessed and compared to those of the two market indices over the sample period. The sample firms are generally fairly liquid, being slightly more liquid than the index stocks. For the sample, 80.0% of stocks were thickly traded (i.e. traded on more than 80% of all trading days), while the comparable percentages were 67.9% and 74.9%, respectively for the stocks in the first and second market indices. Hence, the liquidity profile of the sample is fairly similar to the two equal-weighted market indices.

	Number of Firms	Trading frequency			
		<40%	40%-59%	60-80%	>80%
Sample	30	6.7%	3.3%	10.0%	80.0%
Market index one	193	0%	9.3%	22.8%	67.9%
Market index two	175	0%	0%	25.1%	74.9%

Appendix 5: Project initiation announcement study robustness test statistics

Patell (1976) standardised abnormal return test

$$T_{PATELL} = \frac{\sum_{i=1}^{N} SAR_{it}}{\sqrt{\sum_{i=1}^{N} \frac{M_i - 2}{M_i - 4}}}$$

where

$$SAR_{it} = \frac{AR_{it}}{S_{ARit}}$$

and

SAR_{it} = standardised abnormal returns of security *i*

M_i = number of non-missing returns in the estimation period for security *i*

AR_{it} = abnormal return series for security *i*

S_{ARit} = standard deviation of the estimation period abnormal returns, and

N = number of securities (events).

Boehmer, Musumeci and Poulsen (1991) standardised cross-sectional test

$$T_{BMP} = \frac{\frac{1}{N}\sum_{i=1}^{N} SAR_{it}}{\sqrt{\frac{1}{N(N-1)}\sum_{i=1}^{N}\left(SAR_{it} - \frac{1}{N}\sum_{i=1}^{N} SAR_{it}\right)^2}}$$

where

SAR_{it} = standardised abnormal returns of security *i* as in the Patell test, and

N = number of securities.

Corrado (1989) rank test

$$T_{CORRADO} = \frac{\frac{1}{N}\sum_{i=1}^{N}\left(rank\left(AR_{it}\right) - \frac{M+1}{2}\right)}{\sqrt{\frac{1}{M}\sum_{i=1}^{M}\left(\frac{1}{N}\sum_{i=1}^{N}\left(rank\left(AR_{it}\right) - \frac{M+1}{2}\right)\right)^2}}$$

where

$rank(AR_{it})$ = rank of security i abnormal return on day t

M_i = number of non-missing returns for security i over the entire sample period

AR_{it} = abnormal return series for security i

N = number of non-missing returns in the cross-section of sample securities on day t

Refer to Cowan (2007) for further details of the above statistics.

Appendix 6: Project initiation study robustness test results

Table A6.1 Analysis of abnormal returns – Market model using alternate market index

	Abnormal returns			Ranked variance-adjusted standardised abnormal returns					
Event days	Mean	Median	Propn. pos. returns	Mean	Std dev	T_{CZ}	T_{PATELL}	T_{BMP}	$T_{CORRADO}$
Panel A. Entire sample (n=55)									
-2	-0.0010	-0.0005	0.49	-0.1444	0.3120	-0.46	-0.46	-0.50	-0.48
-1	-0.0031	-0.0020	0.33	-0.5093	0.3120	-1.63	-1.41	-1.44	-1.62
0	0.0029	-0.0003	0.49	0.3885	0.3120	1.24	0.94	0.83	1.34
1	0.0045	0.0023	0.58	0.5286	0.3120	1.69[c]	2.10[b]	1.99[b]	1.75[c]
2	0.0011	0.0006	0.53	0.2398	0.3120	0.77	0.22	0.26	0.75
Event window									
(-1,0)	-0.0002	-0.0015	0.45	-0.1208	0.4413	-0.27	-0.33	-0.35	-0.20
(0,+1)	0.0074	0.0051	0.56	0.9171	0.4413	2.08[b]	2.15[b]	1.93[c]	2.18[b]
(-1,+1)	0.0043	0.0023	0.56	0.4078	0.5404	0.75	0.97	0.97	0.85
(0,+2)	0.0085	0.0023	0.60	1.1569	0.5404	2.14[b]	1.91[c]	2.09[b]	2.21[b]
(-2,+2)	0.0044	0.0047	0.56	0.5032	0.6977	0.72	0.66	0.70	0.78
Panel B. Excluding ETC=0 (n=47)									
-2	-0.0010	-0.0012	0.45	-0.1834	0.3157	-0.58	-0.59	-0.65	-0.57
-1	-0.0038	-0.0025	0.30	-0.4765	0.3157	-1.51	-1.47	-1.44	-1.64
0	0.0033	0.0003	0.49	0.3640	0.3157	1.15	0.99	0.82	1.26
1	0.0048	0.0023	0.60	0.5802	0.3157	1.84[c]	2.30[b]	2.18[b]	1.85[c]
2	0.0006	-0.0005	0.49	0.0864	0.3157	0.27	-0.02	-0.02	0.27
Event window									
(-1,0)	-0.0006	-0.0028	0.41	-0.1124	0.4465	-0.25	-0.34	-0.36	-0.27
(0,+1)	0.0080	0.0058	0.57	0.9442	0.4465	2.11[b]	2.33[b]	2.06[b]	2.20[b]
(-1,+1)	0.0042	0.0003	0.55	0.4678	0.5468	0.86	1.08	1.10	0.85
(0,+2)	0.0086	0.0022	0.55	1.0301	0.5468	1.88[c]	1.92[c]	2.01[b]	1.95[c]
(-2,+2)	0.0038	0.0034	0.53	0.3708	0.7059	0.53	0.58	0.61	0.52

[a, b] and [c] denote statistical significance at the 1%, 5%, and10% levels, respectively, using a two-tailed test

Table A6.2 Analysis of market-adjusted returns

	Abnormal returns			Ranked variance-adjusted standardised abnormal returns					
Event days	Mean	Median	Propn. pos. returns	Mean	Std dev	T_{CZ}	T_{PATELL}	T_{BMP}	$T_{CORRADO}$
Panel A. Entire sample (n=55)									
-2	-0.0016	-0.0021	0.47	-0.2368	0.3063	-0.77	-0.60	-0.65	-0.72
-1	-0.0036	-0.0035	0.25	-0.7311	0.3063	-2.39[b]	-1.51	-1.69[c]	-2.20[b]
0	0.0039	-0.0021	0.60	0.5577	0.3063	1.82[c]	1.43	1.24	1.83[c]
1	0.0045	0.0021	0.64	0.5885	0.3063	1.92[c]	2.24[b]	2.08[b]	1.96[c]
2	0.0004	0.0007	0.55	0.1978	0.3063	0.65	0.10	0.11	0.59
Event window									
(-1,0)	0.0003	-0.0011	0.47	-0.1734	0.4332	-0.40	-0.05	-0.06	-0.26
(0,+1)	0.0083	0.0031	0.58	1.1462	0.4332	2.65[a]	2.62[a]	2.21[b]	2.68[a]
(-1,+1)	0.0047	0.0017	0.53	0.4151	0.5306	0.78	1.26	1.23	0.92
(0,+2)	0.0087	0.0025	0.55	1.3440	0.5306	2.53[b]	2.20[b]	2.32[b]	2.53[b]
(-2,+2)	0.0036	0.0020	0.55	0.3760	0.6850	0.55	0.75	0.75	0.65
Panel B. Excluding ETC=0 (n=47)									
-2	-0.0016	-0.0031	0.45	-0.2872	0.3220	-0.89	-0.73	-0.79	-0.85
-1	-0.0040	-0.0035	0.23	-0.7260	0.3220	-2.25[b]	-1.50	-1.62	-2.09[b]
0	0.0041	0.0021	0.60	0.4359	0.3220	1.35	1.37	1.11	1.43
1	0.0052	0.0021	0.68	0.6808	0.3220	2.11[b]	2.62[a]	2.48[b]	2.14[b]
2	0.0004	0.0012	0.55	0.1357	0.3220	0.42	0.03	0.04	0.43
Event window									
(-1,0)	0.0001	-0.0029	0.45	-0.2901	0.4554	-0.64	-0.10	-0.10	-0.46
(0,+1)	0.0092	0.0065	0.60	1.1168	0.4554	2.45[b]	2.85[a]	2.34[b]	2.53[b]
(-1,+1)	0.0053	0.0017	0.53	0.3908	0.5578	0.70	1.45	1.42	0.86
(0,+2)	0.0096	0.0040	0.55	1.2525	0.5578	2.25[b]	2.34[b]	2.38[b]	2.31[b]
(-2,+2)	0.0040	0.0020	0.53	0.2392	0.7201	0.33	0.81	0.79	0.48

[a, b] and [c] denote statistical significance at the 1%, 5%, and10% levels, respectively, using a two-tailed test

Table A6.3 Analysis of abnormal returns – Market model using alternate estimation period (-170,-10)

	Abnormal returns			Ranked variance-adjusted standardised abnormal returns					
Event days	Mean	Median	Propn. pos. returns	Mean	Std dev	T_{CZ}	T_{PATELL}	T_{BMP}	$T_{CORRADO}$
Panel A. Entire sample (n=55)									
-2	-0.0014	-0.0004	0.49	-0.1503	0.2952	-0.51	-0.51	-0.59	-0.51
-1	-0.0033	-0.0027	0.31	-0.5992	0.2952	-2.03[b]	-1.59	-1.72[c]	-1.78[c]
0	0.0034	0.0011	0.53	0.4302	0.2952	1.46	1.23	1.12	1.44
1	0.0039	0.0022	0.60	0.5309	0.2952	1.80[c]	1.89[c]	1.92[c]	1.78[c]
2	0.0010	0.0010	0.53	0.2602	0.2952	0.88	0.19	0.23	0.75
Event window									
(-1,0)	0.0001	-0.0019	0.44	-0.1690	0.4174	-0.40	-0.26	-0.30	-0.24
(0,+1)	0.0074	0.0047	0.58	0.9611	0.4174	2.30[b]	2.19[b]	2.02[b]	2.28[b]
(-1,+1)	0.0040	0.0010	0.55	0.3619	0.5113	0.71	0.89	0.95	0.83
(0,+2)	0.0084	0.0030	0.60	1.2213	0.5113	2.39[b]	1.89[c]	2.21[b]	2.29[b]
(-2,+2)	0.0036	0.0059	0.56	0.4718	0.6600	0.71	0.53	0.60	0.75
Panel B. Excluding ETC=0 (n=47)									
-2	-0.0013	-0.0010	0.45	-0.2231	0.2934	-0.76	-0.60	-0.71	-0.65
-1	-0.0040	-0.0032	0.30	-0.5948	0.2934	-2.03[b]	-1.68[c]	-1.72[c]	-2.04[b]
0	0.0038	0.0011	0.53	0.3472	0.2934	1.18	1.27	1.09	1.41
1	0.0042	0.0023	0.64	0.6174	0.2934	2.10[b]	2.11[b]	2.18[b]	2.04[b]
2	0.0007	0.0010	0.51	0.1964	0.2934	0.67	0.04	0.04	0.45
Event window									
(-1,0)	-0.0002	-0.0024	0.40	-0.2476	0.4150	-0.60	-0.29	-0.32	-0.45
(0,+1)	0.0079	0.0061	0.57	0.9646	0.4150	2.32[b]	2.37[b]	2.16[b]	2.44[b]
(-1,+1)	0.0040	0.0010	0.53	0.3698	0.5082	0.73	0.99	1.07	0.81
(0,+2)	0.0087	0.0030	0.60	1.1610	0.5082	2.28[b]	1.94[c]	2.19[b]	2.25[b]
(-2,+2)	0.0034	0.0059	0.55	0.3431	0.6561	0.52	0.50	0.55	0.54

[a, b] and [c] denote statistical significance at the 1%, 5%, and10% levels, respectively, using a two-tailed test

Table A6.4 Robustness tests for Models 3 and 4 cross-sectional regression analyses of project initiation announcement cumulative abnormal returns, (t-statistics)

Variable	Predicted sign	CAR(0,+1)) Model 7 (n=46)	CAR(0,+2) Model 8 (n=46)	CAR(0,+1) Model 9 (n=46)	CAR(0,+2) Model 10 (n=46)	CAR(0,+1) Model 11 (n=46)	CAR(0,+2) Model 12 (n=46)	CAR(0,+1) Model 13 (n=46)	CAR(0,+2) Model 14 (n=46)	CAR(0,+1)) Model 15 (n=32)	CAR(0,+2) Model 16 (n=32)
Constant	n/a	0.2286 (3.52)[a]	0.1718 (2.83)[a]	0.2257 (3.37)[a]	0.1691 (2.81)[a]	0.2146 (3.26)[a]	0.1707 (2.78)[a]	0.2319 (3.36)[a]	0.1855 (2.96)[a]	0.2735 (3.66)[a]	0.1992 (2.74)[a]
ETCDUM	+	0.0175 (2.46)[b]	0.0154 (2.40)[b]	0.0175 (2.45)[b]	0.0157 (2.42)[b]	0.0159 (2.21)[b]	0.0152 (2.29)[b]	0.0189 (2.56)[a]	0.0185 (3.05)[a]	0.0169 (1.91)[c]	0.0132 (1.73)[c]
LNMVA	-	-0.0115 (-3.64)[a]	-0.0085 (-2.90)[a]	-0.0113 (-3.45)[a]	-0.0085 (-2.91)[a]	-0.0111 (-3.50)[a]	-0.0085 (-2.92)[a]	-0.0119 (-3.40)[a]	-0.0100 (-3.23)[a]	-0.0134 (-3.65)[a]	-0.0095 (-2.73)[a]
REFORMDUM	n/a	0.0053 (0.82)	-0.0007 (-0.12)								
JVDUM	+			0.0006 (0.08)	0.0062 (0.75)						
MB	+					0.0070 (0.93)	0.0009 (0.09)				
LEV	+							0.0157 (0.75)	0.0358 (1.84)[c]		
INV/MVE	+									-0.0222 (-1.18)	-0.0135 (-0.69)
Adjusted R^2		0.247	0.178	0.238	0.188	0.247	0.178	0.246	0.232	0.266	0.183

[a, b] and [c] denote statistical significance at the 1%, 5%, and10% levels, respectively, using a two-tailed test

Table A6.5 Robustness tests for Models 5 and 6 cross-sectional regression analyses of project initiation announcement cumulative abnormal returns, (t-statistics)

Variable	Predicted sign	CAR(0,+1) Model 17 (n=45)	CAR(0,+2) Model 18 (n=45)	CAR(0,+1) Model 19 (n=46)	CAR(0,+2) Model 20 (n=46)	CAR(0,+1)) Model 21 (n=46)	CAR(0,+2) Model 22 (n=46)	CAR(0,+1) Model 23 (n=46)	CAR(0,+2) Model 24 (n=46)	CAR(0,+1) Model 25 (n=46)	CAR(0,+2) Model 26 (n=46)
Constant	n/a	0.2360 (4.54)[a]	0.2094 (4.27)[a]	0.2715 (4.73)[a]	0.2082 (4.11)[a]	0.2670 (4.58)[a]	0.2085 (4.54)[a]	0.2477 (4.34)[a]	0.2175 (4.92)[a]	0.2786 (4.97)[a]	0.2191 (4.75)[a]
ETCDUM	+	0.0155 (2.22)[b]	0.0150 (2.21)[b]	0.0195 (2.58)[a]	0.0155 (2.36)[b]	0.0164 (2.09)[b]	0.0119 (1.68)[c]	0.0211 (2.53)[b]	0.0175 (2.59)[a]	0.0155 (2.12)[b]	0.0152 (2.19)[b]
LNMVA	-	-0.012 (-4.51)[a]	-0.0104 (-4.34)[a]	-0.0138 (-4.72)[a]	-0.0103 (-4.09)[a]	-0.0139 (-4.70)[a]	-0.0108 (-4.87)[a]			-0.0142 (-4.90)[a]	-0.0109 (-4.85)[a]
RCDUM	+	0.0129 (1.62)	0.0112 (1.51)	0.0173 (2.00)[b]	0.0123 (1.67)[c]	0.0176 (2.03)[b]	0.0126 (1.75)[c]	0.0163 (1.81)[c]	0.0122 (1.64)	0.0165 (2.00)[b]	0.0121 (1.69)[c]
DISCLOSDUM	n/a	-0.0095 (-1.57)	-0.0144 (-2.23)[b]	-0.0127 (-1.93)[c]	-0.0158 (-2.51)[b]	-0.1123 (-1.68)[c]	-0.0135 (-2.09)[b]	-0.0142 (-2.05)[b]	-0.0168 (-2.67)[a]	-0.0160 (-2.49)[b]	-0.0158 (-2.35)[b]
ENERGDUM	+			-0.0012 (-0.19)	-0.0036 (-0.55)						
MEDIADUM	+					0.0089 (1.23)	0.0110 (1.60)				
LNMVE	-							-0.0129 (-4.25)[a]	-0.0111 (-4.95)[a]		
VOL	-									5.5794 (3.41)[s]	1.1098 (0.43)
Adjusted R^2		0.307	0.270	0.342	0.301	0.358	0.328	0.318	0.333	0.398	0.300

[a, b] and [c] denote statistical significance at the 1%, 5%, and10% levels, respectively, using a two-tailed test

Appendix 7: Resource consent study robustness test results

Table A7.1 Analysis of ranked absolute abnormal returns – Market model using alternate market index

Event days	Absolute abnormal return		Ranked absolute abnormal returns		
	Mean	Median	Mean	Std dev	T
Panel A. Entire sample (n=90)					
-2	0.0136	0.0085	0.5108	0.2682	1.90[b]
-1	0.0156	0.0076	0.3980	0.2682	1.48[c]
0	0.0218	0.0086	0.5483	0.2682	2.04[b]
1	0.0146	0.0062	-0.1944	0.2682	-0.72
2	0.0157	0.0085	0.3729	0.2682	1.39[c]
Event window					
(-1,0)	0.0291	0.0124	0.9462	0.3793	2.49[a]
(0,+1)	0.0328	0.0124	0.3539	0.3793	0.93
(-1,+1)	0.0375	0.0134	0.7518	0.4646	1.62[c]
(-2,0)	0.0293	0.0108	1.4570	0.4646	3.14[a]
(-2,+2)	0.0433	0.0190	1.6355	0.5998	2.73[a]
Panel B. Entire sample without days ±2 contaminated events (n=82)					
-2	0.0128	0.0083	0.4951	0.2680	1.85[b]
-1	0.0154	0.0064	0.2478	0.2680	0.92
0	0.0219	0.0086	0.4712	0.2680	1.76[b]
1	0.0148	0.0059	-0.2822	0.2680	-1.05
2	0.0163	0.0085	0.3748	0.2680	1.40[c]
Event window					
(-1,0)	0.0287	0.0114	0.7190	0.3790	1.90[b]
(0,+1)	0.0332	0.0124	0.1890	0.3790	0.50
(-1,+1)	0.0372	0.0133	0.4368	0.4642	0.94
(-2,0)	0.0279	0.0102	1.2141	0.4642	2.62[a]
(-2,+2)	0.0423	0.0179	1.3066	0.5993	2.18[b]

[a, b] and [c] denote statistical significance at the 1%, 5%, and10% levels, respectively, using a one-tailed test

Table A7.2 Analysis of ranked absolute market-adjusted returns

Event days	Absolute excess return		Ranked absolute excess returns		
	Mean	Median	Mean	Std dev	T
Panel A. Entire sample (n=90)					
-2	0.0135	0.0083	0.5444	0.2763	1.97[b]
-1	0.0149	0.0074	0.2327	0.2763	0.84
0	0.0228	0.0098	0.7332	0.2763	2.65[a]
1	0.0141	0.0047	-0.3380	0.2763	-1.22
2	0.0151	0.0068	0.1075	0.2763	0.39
Panel B. Entire sample without days ±2 contaminated events (n=82)					
-2	0.0127	0.0081	0.5212	0.2787	1.87[b]
-1	0.0148	0.0072	0.1201	0.2787	0.46
0	0.0230	0.0098	0.6206	0.2787	2.23[b]
1	0.0144	0.0047	-0.3740	0.2787	-1.34
2	0.0157	0.0068	0.1150	0.2787	0.41

[a, b] and [c] denote statistical significance at the 1%, 5%, and10% levels, respectively, using a one-tailed test

Table A7.3 Analysis of absolute abnormal returns – Market model using alternate estimation period (-170, -10)

Event days	Absolute abnormal return		Ranked absolute abnormal returns		
	Mean	Median	Mean	Std dev	T
Panel A. Entire sample (n=90)					
-2	0.0136	0.0084	0.4107	0.2894	1.42[c]
-1	0.0154	0.0077	0.3293	0.2894	1.14
0	0.0219	0.0092	0.6107	0.2894	2.11[b]
1	0.0144	0.0063	-0.1996	0.2894	-0.69
2	0.0153	0.0083	0.3055	0.2894	1.06
Panel B. Entire sample without days ±2 contaminated events (n=82)					
-2	0.0128	0.0082	0.4001	0.2849	1.40[c]
-1	0.0152	0.0070	0.2292	0.2849	0.80
0	0.0221	0.0092	0.5424	0.2849	1.90[b]
1	0.0148	0.0060	-0.2275	0.2849	-0.80
2	0.01587	0.0083	0.3286	0.2849	1.15

[a, b] and [c] denote statistical significance at the 1%, 5%, and10% levels, respectively, using a one-tailed test

Table A7.4 Analysis of ranked absolute abnormal returns pre- and post-reform, December 2002, using alternate market index

Event days	Ranked absolute abnormal returns						Absolute abnormal returns		
	Pre-reform n=38			Post-reform n=52			Pre-reform	Post-reform	Wilcoxon Z
	Mean	Std dev	T	Mean	Std dev	T	(1) Median	(2) Median	(1)-(2)
-2	0.2478	0.2801	0.88	0.4601	0.2523	1.82[b]	0.0080	0.0088	-0.30
-1	0.7234	0.2801	2.58[a]	-0.0948	0.2523	-0.38	0.0104	0.0052	1.86[b]
0	0.1177	0.2801	0.42	0.6207	0.2523	2.46[a]	0.0080	0.0096	-1.21
1	0.1317	0.2801	0.47	-0.3683	0.2523	-1.46	0.0079	0.0054	0.92
2	0.3322	0.2801	1.19	0.2066	0.2523	0.82	0.0101	0.0074	0.56
Event window									
(-1,0)	0.8411	0.3961	2.12[b]	0.5258	0.3568	1.47[c]	0.0166	0.0100	2.28[a]
(0,+1)	0.2494	0.3961	0.63	0.2523	0.3568	0.71	0.0112	0.0125	0.06
(-1,+1)	0.9728	0.4851	2.01[b]	0.1575	0.4370	0.36	0.0192	0.0112	1.70[b]
(-2,0)	1.0890	0.4851	2.24[b]	0.9859	0.4370	2.26[b]	0.0185	0.0098	2.32[a]
(-2,+2)	1.5528	0.6263	2.48[a]	0.8242	0.5641	1.46[c]	0.0268	0.0143	3.40[a]

[a, b] and [c] denote statistical significance at the 1%, 5%, and10% levels, respectively, using a one-tailed test

Table A7.5 Analysis of ranked absolute abnormal returns pre- and post-reform, August 2003

Event days	Ranked absolute abnormal returns						Absolute abnormal returns		
	Pre-reform n=45			Post-reform n=45			Pre-reform	Post-reform	Wilcoxon Z
	Mean	Std dev	T	Mean	Std dev	T	(1) Median	(2) Median	(1)-(2)
-2	0.4456	0.2816	1.58[c]	0.1733	0.2666	0.65	0.0080	0.0076	0.24
-1	0.6904	0.2816	2.45[a]	-0.2828	0.2666	-1.06	0.0099	0.0053	2.07[b]
0	0.4200	0.2816	1.49[c]	0.5707	0.2666	2.14[b]	0.0085	0.0099	-0.38
1	0.0028	0.2816	0.01	-0.3052	0.2666	-1.14	0.0075	0.0063	0.39
2	0.1898	0.2816	0.67	0.2819	0.2666	1.06	0.0088	0.0095	0.09

[a, b] and [c] denote statistical significance at the 1%, 5%, and10% levels, respectively, using a one-tailed test

Table A7.6 Analysis of absolute abnormal returns by news classification using alternate market index

	Ranked absolute abnormal returns									Absolute abnormal returns					
	Successful n=44			Uncertain n=42			Unsuccessful n=4			Successful	Uncertain	Unsuccessful	Wilcoxon Z		
Event days	Mean	Std dev	T	Mean	Std dev	T	Mean	Std dev	T	(1) Median	(2) Median	(3) Median	(2)-(1)	(3)-(2)	(3)-(2)
-2	0.4780	0.2792	1.72[b]	0.4342	0.2988	1.45[c]	-0.5697	0.2860	-1.99	0.0103	0.0083	0.0025	-0.13	-1.93[b]	-2.14[b]
-1	0.1477	0.2792	0.53	0.3517	0.2988	1.18	0.2582	0.2860	0.90	0.0057	0.0078	0.0124	0.04	1.07	1.14
0	0.2571	0.2792	0.92	0.3536	0.2988	1.18	0.6025	0.2860	2.11	0.0086	0.0083	0.0239	0.07	1.97[b]	2.03[b]
1	-0.3275	0.2792	-1.17	-0.0050	0.2988	-0.02	0.1803	0.2860	0.63	0.0063	0.0059	0.0157	0.51	0.84	0.88
2	0.2567	0.2792	0.92	0.1503	0.2988	0.50	0.4303	0.2860	1.50	0.0085	0.0078	0.0387	-0.25	1.58	1.59

[a, b] and [c] denote statistical significance at the 1%, 5%, and10% levels, respectively, using a one-tailed test

Table A7.7 Supplemental tests for Models 3 – 7 cross-sectional rank regression analyses of resource consent announcement absolute abnormal returns, (t-statistics)

Variable	Predicted sign	AAR(0) Model 8	AAR(0) Model 9	AAR(0) Model 10	ACAR(-1,+1) Model 11	ACAR(-2,+2) Model 12
Constant	n/a	0.5126 (4.85)[a]	0.4737 (4.36)[a]	0.4912 (12.15)[a]	0.6139 (5.46)[a]	0.6798 (5.81)[a]
SCSDUM	-	-0.0573 (-0.98)	-0.0555 (-0.97)	-0.0487 (-0.83)	-0.0702 (-1.22)	0.0332 (0.56)
UNSCSDUM	+	0.2799 (3.17)[a]	0.3204 (4.69)[a]	0.3896 (6.22)[a]	0.2980 (3.29)[a]	0.1279 (1.39)
REFORMDUM	−	0.1518 (2.42)[b]	0.0811 (1.32)		-0.0851 (-1.42)	-0.1777 (-2.67)[a]
MB	+	0.1290 (1.16)	0.1476 (1.33)		0.2345 (2.14)[b]	0.1882 (1.63)
LEV	+	-0.1006 (-1.06)	0.0409 (0.41)		-0.0647 (-0.68)	0.1043 (0.90)
MVE	−	-0.2290 (-2.30)[b]	-0.2369 (-1.64)		-0.1897 (-1.63)	-0.2923 (-2.79)[a]
MEDIADUM	+	0.1628 (2.21)[b]	0.1294 (1.88)[c]	0.1222 (1.63)		
PATDUM	+	-0.1543 (-1.71)[c]	-0.1668 (-2.15)[b]	-0.1785 -(2.72)[a]	-0.0842 (-1.06)	0.0319 (0.49)
DISCLOSDUM	n/a	-0.0262 (-0.46)	-0.0429 (-0.80)		-0.0950 (-1.80)[c]	-0.1121 (-2.02)[b]
FINCON	n/a		0.0480 (0.50)		-0.0425 (-0.46)	-0.0815 (-0.91)
UTILS	n/a		0.0506 (0.47)		0.0551 (0.53)	-0.0114 (-0.12)
OILGS	n/a		0.2099 (2.39)[b]	0.2496 (4.11)[a]	0.0630 (0.51)	-0.1731 (-1.44)
BMATR	n/a		-0.2914 (-3.12)[a]	-0.2908 (-6.58)[a]	-0.2135 (-1.81)[c]	-0.2031 (-1.63)
INDUS	n/a		-0.0144) (-0.14)		0.0355 (0.35)	-0.1043 (-1.07)
CONTAMDUM	n/a					0.1456 (1.73)[c]
Adjusted R^2		0.138	0.202	0.221	0.157	0.214

[a, b] and [c] denote statistical significance at the 1%, 5%, and10% levels, respectively, using a two-tailed test

Table A7.8 Analysis of ranked abnormal returns – Market model using alternate market index

Event days	Abnormal returns			Ranked variance-adjusted standardised abnormal returns		
	Mean	Median	Propn.pos. returns	Mean	Std dev	T
Panel A. Entire sample (n=90)						
-2	-0.0022	-0.0013	0.46	-0.2004	0.2654	-0.76
-1	0.0024	-0.0017	0.43	0.1589	0.2654	0.60
0	0.0064	-0.0005	0.48	0.2873	0.2654	1.08
1	0.0041	-0.0002	0.49	0.1477	0.2654	0.56
2	-0.0040	-0.0015	0.42	0.0043	0.2654	0.02
Event window						
(-1,0)	0.0088	-0.0015	0.47	0.4462	0.3753	1.19
(0,+1)	0.0105	-0.0001	0.48	0.4349	0.3753	1.16
(-1,+1)	0.0129	-0.0027	0.44	0.5939	0.4596	1.29
(0,+2)	0.0064	0.0018	0.54	0.4392	0.4596	0.96
(-2,+2)	0.0067	-0.0001	0.49	0.3978	0.5934	0.67
Panel B. Successful subsample (n=44)						
-2	0.0024	-0.0018	0.43	-0.0490	0.2593	-0.19
-1	0.0035	-0.0024	0.41	0.0359	0.2593	0.14
0	0.0101	0.0001	0.50	0.2687	0.2593	1.04
1	-0.0011	0.0004	0.52	-0.0028	0.2593	-0.01
2	0.0022	0.0023	0.52	0.5272	0.2593	2.03[b]
Event window						
(-1,0)	0.0136	0.0037	0.55	0.3046	0.3667	0.83
(0,+1)	0.0089	0.0003	0.50	0.2659	0.3667	0.73
(-1,+1)	0.0124	-0.0025	0.48	0.3018	0.4491	0.67
(0,+2)	0.0112	0.0032	0.64	0.7931	0.4491	1.76[c]
(-2,+2)	0.0170	0.0102	0.61	0.7800	0.5798	1.35
Panel C. Uncertain subsample (n=42)						
-2	-0.0070	-0.0000	0.50	-0.2040	0.2675	-0.76
-1	0.0036	-0.0008	0.48	0.1881	0.2675	0.70
0	0.0088	0.0001	0.50	0.3364	0.2675	1.26
1	0.0126	0.0002	0.50	0.3043	0.2675	1.14
2	-0.0101	-0.0032	0.31	-0.6747	0.2675	-2.52[b]
Event window						
(-1,0)	0.0124	-0.0022	0.43	0.5245	0.3783	1.39
(0,+1)	0.0214	0.0001	0.50	0.6407	0.3783	1.69[c]
(-1,+1)	0.0250	-0.0017	0.45	0.8288	0.4633	1.79[c]
(0,+2)	0.0113	-0.0018	0.48	-0.0340	0.4633	-0.07
(-2,+2)	0.0079	-0.0067	0.38	-0.0499	0.5981	-0.08
Panel D. Unsuccessful subsample (n=4)						
-2	-0.0012	-0.0022	0.25	-0.3033	0.2882	-1.05
-1	-0.0218	-0.0063	0.25	-0.1885	0.2882	-0.65
0	-0.0597	-0.0239	0.00	-0.6189	0.2882	-2.15
1	-0.0282	-0.0157	0.00	-0.5328	0.2882	-1.85
2	-0.0093	0.0038	0.50	0.0738	0.2882	0.26
Event window						
(-1,0)	-0.0815	-0.0222	0.00	-0.8074	0.4076	-1.98
(0,+1)	-0.0878	-0.0396	0.00	-1.1516	0.4076	-2.83[c]
(-1,+1)	-0.1096	-0.0335	0.00	-1.3402	0.4991	-2.68[c]
(0,+2)	-0.0972	-0.0280	0.25	-1.0779	0.4991	-2.16
(-2,+2)	-0.1202	-0.0243	0.25	-1.5697	0.6444	-2.44[c]

[a, b] and [c] denote statistical significance at the 1%, 5%, and10% levels, respectively, using a two-tailed test

Table A7.9 Analysis of ranked market-adjusted returns

Event days	Abnormal returns			Ranked variance-adjusted excess returns		
	Mean	Median	Propn.pos. returns	Mean	Std dev	T
Panel A. Entire sample (n=90)						
-2	-0.0009	0.0005	0.51	-0.0741	0.2662	-0.28
-1	0.0030	-0.0015	0.44	0.0238	0.2662	0.09
0	0.0065	-0.0003	0.50	0.0898	0.2662	0.34
1	0.0042	0.0002	0.52	0.2005	0.2662	0.75
2	-0.0032	-0.0001	0.48	0.0493	0.2662	0.19
Panel B. Successful subsample (n=44)						
-2	0.0029	-0.0010	0.48	-0.0268	0.2609	-0.10
-1	0.0033	-0.0022	0.41	-0.0383	0.2609	-0.15
0	0.0107	0.0004	0.55	0.2218	0.2609	0.85
1	-0.0010	0.0001	0.50	0.0475	0.2609	0.18
2	0.0021	0.0021	0.57	0.5846	0.2609	2.24[b]
Panel C. Uncertain subsample (n=42)						
-2	-0.0050	0.0021	0.55	-0.0431	0.2754	-0.16
-1	0.0052	0.0005	0.50	0.1470	0.2754	0.53
0	0.0084	-0.0003	0.50	0.1170	0.2754	0.42
1	0.0127	0.0013	0.57	0.3668	0.2754	1.33
2	-0.0085	-0.0019	0.38	-0.5757	0.2754	-2.09[b]
Panel D. Unsuccessful subsample (n=4)						
-2	-0.0005	-0.0001	0.50	0.0000	0.2984	0.00
-1	-0.0244	-0.0052	0.25	-0.3402	0.2984	-1.14
0	-0.0592	-0.0223	0.00	-0.6762	0.2984	-2.27
1	-0.0283	-0.0171	0.25	-0.5451	0.2984	-1.83
2	-0.0062	0.0075	0.50	0.0697	0.2984	0.23

[a, b] and [c] denote statistical significance at the 1%, 5%, and10% levels, respectively, using a two-tailed test

Table A7.10 Analysis of ranked abnormal returns without variance adjustment

Event days	Abnormal returns			Ranked standardised abnormal returns		
	Mean	Median	Propn.pos. returns	Mean	Std dev	T
Panel A. Entire sample (n=90)						
-2	-0.0019	-0.0013	0.46	-0.1905	0.2629	-0.72
-1	0.0021	-0.0016	0.42	0.0022	0.2629	0.01
0	0.0065	0.0005	0.51	0.2161	0.2629	0.82
1	0.0043	0.0001	0.51	0.1967	0.2629	0.75
2	-0.0037	-0.0009	0.44	-0.0185	0.2629	-0.07
Panel B. Successful subsample (n=44)						
-2	0.0023	-0.0021	0.43	-0.1090	0.2598	-0.42
-1	0.0031	-0.0022	0.41	-0.0333	0.2598	-0.13
0	0.0102	0.0014	0.57	0.2873	0.2598	1.11
1	-0.0006	0.0003	0.55	0.1241	0.2598	0.48
2	0.0025	0.0018	0.52	0.5468	0.2598	2.14[b]
Panel C. Uncertain subsample (n=42)						
-2	-0.0065	0.0003	0.50	-0.1383	0.2641	-0.52
-1	0.0034	-0.0006	0.45	0.1106	0.2641	0.42
0	0.0090	0.0003	0.50	0.2765	0.2641	1.05
1	0.0125	0.0016	0.52	0.3216	0.2641	1.22
2	-0.0098	-0.0033	0.36	-0.6248	0.2641	-2.37[b]
Panel D. Unsuccessful subsample (n=4)						
-2	-0.0011	-0.0014	0.25	-0.0943	0.2974	-0.32
-1	-0.0220	-0.0063	0.25	-0.2377	0.2974	-0.80
0	-0.0620	-0.0286	0.00	-0.8238	0.2974	-2.77[c]
1	-0.0282	-0.0164	0.00	-0.5205	0.2974	-1.75
2	-0.0082	0.0048	0.50	0.0902	0.2974	0.30

[a, b] and [c] denote statistical significance at the 1%, 5%, and10% levels, respectively, using a two-tailed test

Table A7.11 Comparison of successful, uncertain and unsuccessful standardised abnormal returns using alternate market index

Event days	Subsample median standardised abnormal returns			Wilcoxon *Z*-statistic		
	(1) Successful, n=44	(2) Uncertain, n=42	(3) Unsuccessful, n=4	(2)-(1)	(3)-(1)	(3)-(2)
-2	-0.1096	0.0095	-0.0755	-0.31	0.21	-0.02
-1	-0.1658	- 0.0123	-0.2982	0.11	-0.84	-0.76
0	0.0137	-0.0153	-1.3433	0.06	-2.48[a]	-2.75[a]
1	0.0264	-0.0148	-0.9176	0.49	-2.07[b]	-2.09[b]
2	0.1676	-0.2366	0.2582	-2.91[a]	0.00	0.80

[a, b] and [c] denote statistical significance at the 1%, 5%, and10% levels, respectively, using a one-tailed exact test

Table A7.12 Analysis of abnormal returns by contemporaneous media coverage using alternate market index

	Ranked variance-adjusted standardised abnormal returns						Abnormal returns				Standardised abnormal returns		
	With media coverage			Without media coverage			With media coverage		Without media coverage		With media coverage	Without media coverage	Wilcoxon Z
Event days	Mean	Std dev	T	Mean	Std dev	T	Median	Propn.pos. returns	Median	Propn.pos. returns	(1) Median	(2) Median	(1)-(2)
Panel A. Successful subsample													
		(n=12)			(n=32)		(n=12)		(n=32)		(n=12)	(n=32)	
0	0.6696	0.2816	2.38[b]	-0.1304	0.2488	-0.52	0.0089	0.83	-0.0010	0.38	0.6093	-0.0818	2.38[b]
1	0.0237	0.2816	0.08	-0.0083	0.2488	-0.03	0.0002	0.50	0.0004	0.53	0.0066	0.0264	0.09
2	0.3833	0.2816	1.36	0.3450	0.2488	1.39	0.0044	0.50	0.0023	0.53	0.1042	0.1676	0.36
3	-0.0615	0.2816	-0.22	0.0764	0.2488	0.31	-0.0027	0.33	0.0003	0.50	-0.0729	0.0341	-0.49
4	-0.3526	0.2816	-1.25	-0.0597	0.2488	-0.24	-0.0054	0.33	-0.0010	0.47	-0.3709	-0.0731	-1.04
5	-0.4117	0.2816	-1.46	0.4961	0.2488	1.99[c]	-0.0044	0.17	0.0015	0.59	-0.2659	0.1186	-2.20[b]
Panel B. Uncertain subsample													
		(n=6)			(n=36)		(n=6)		n=36		(n=6)	(n=36)	
0	0.2464	0.2972	0.83	0.2920	0.2583	1.13	-0.0019	0.33	0.0009	0.53	-0.1564	0.0421	0.02
1	0.4979	0.2972	1.68	0.1090	0.2583	0.42	0.0136	0.67	-0.0006	0.47	1.0055	-0.0458	1.56
2	-0.7714	0.2972	-2.59[b]	-0.4688	0.2583	-1.81[c]	-0.0121	0.17	-0.0017	0.33	-0.6806	-0.1459	-1.17
3	-0.1910	0.2972	-0.64	-0.0269	0.2583	-0.10	-0.0029	0.17	-0.0007	0.44	-0.1998	-0.0544	-0.67
4	0.2336	0.2972	0.79	0.1798	0.2583	0.69	0.0024	0.50	0.0006	0.53	0.1937	0.0244	0.31
5	-0.1424	0.2972	-0.48	-0.1442	0.2583	-0.56	-0.0022	0.33	-0.0005	0.47	-0.1727	-0.0459	-0.45

[a, b] and [c] denote statistical significance at the 1%, 5%, and10% levels, respectively, using a two-tailed Corrado rank T-test or two-tailed Wilcoxon Z exact test

Table A7.13 Supplemental tests for Model 5 cross-sectional rank regression model of abnormal returns, (t-statistics)

Variable	Predicted sign	AR(0) Model 8	AR(0) Model 9
Constant	n/a	0.1331 (1.54)	0.1326 (1.31)
SCSDUM	+	0.4762 (5.66)[a]	0.4747 (5.57)[a]
UNCDUM	+	0.4931 (5.67)[a]	0.4918 (5.62)[a]
MEDIADUM	+	0.1177 (1.79)[c]	0.1186 (1.78)[c]
MVE	−	-0.2248 (-2.34)[b]	-0.2236 (-2.36)[b]
PREMEDIADUM	−	0.0085 (0.13)	
VOL	−		0.0046 (0.04)
Adjusted R^2		0.147	0.147

[a, b] and [c] denote statistical significance at the 1%, 5%, and10% levels, respectively, using a two-tailed test

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