COUNTING THE COST
THE ECONOMIC EFFECTS OF A MAJOR EARTHQUAKE

Report on an EQC/Insurance Council seminar held in Wellington, 25 February 1998

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BACKGROUND

The *Wellington after the Quake* conference, organised by the Earthquake Commission in Wellington in March 1995, sought to answer some of the questions faced by all concerned with the recovery and restoration phases of a major earthquake in a nationally significant city. The papers, which were by a range of international authorities, and the discussions were published later that year, and some copies of the volume are still available from the Earthquake Commission.

Then, in November 1996, the Earthquake Commission and the Insurance Council of New Zealand jointly sponsored a seminar on *Natural Hazards: Finding, managing and sharing people and information*, and a summary booklet was prepared as a record for those who attended and to inform those who were unable to attend.

This seminar, *Counting the Cost: The economic effects of a major earthquake*, was again sponsored jointly by the Earthquake Commission and the Insurance Council of New Zealand, with the intention of looking more closely at the economic effects of a major earthquake. It attracted about 200 participants, most coming from the insurance and banking industries, fund and risk managers, and economists in a range of organisations, although there were also representatives from emergency management and civil defence organisations, local and regional councils, and earthquake engineers.

This report on the information presented in the papers and discussions has been prepared to highlight the main conclusions and themes raised, for both the attendees and a wider audience who were unable to be present.

INTRODUCTION

The Northridge earthquake in California in 1994 caused much more damage than expected and a considerable burden on all the emergency services, the insurance industry, engineering and other professionals, and the construction industries, lasting well beyond the immediate response phase. Largely because of the perceived need for planning for the restoration and recovery phases of such a damaging event, the *Wellington after the Quake* conference was organised to specify the sort of measures that could be taken in advance of a major earthquake in a city to prepare it better to cope with reconstruction.

That conference emphasised the need to plan for recovery before the disaster occurs.

Since then, in New Zealand, there has been a considerable amount of planning towards the physical reconstruction of buildings and lifelines, and a more effective framework for emergency management organisations is being implemented. Little progress has been made in planning for social recovery. There has also been, until now, a need for in-depth consideration of economic planning – particularly who will bear the costs, where the money will come from, and what repercussions there will be, regionally and nationally.

At the *Wellington after the Quake* conference, Professor Hal Cochrane estimated the total cost of the big earthquake in Wellington to be about US$24 billion. This staggering figure underlined the significance of financial preparedness. The Earthquake Commission contracted the NZ Institute of Economic Research to examine the economic effects of a major earthquake in Wellington and to carry out simulations, using a macroeconomic model.

The study has given rise to a definitive report [1], which was summarised by its author, John Savage, at the current seminar. It was also referred to by most of the other speakers, who were able to add their own perspectives and deal in more depth with their specific areas of expertise.

OBJECTIVES

The seminar on *Counting the Cost: The economic effects of a major earthquake* was sponsored jointly by the Earthquake Commission and the Insurance Council of New Zealand.

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It was directed to financial institutions, including banks, insurance and reinsurance companies, and fund management companies, as well as government departments and any other organisations likely to be involved in (a) the maintenance of a stable economic situation against shocks produced by events such as a major disaster and (b) the provision of financial resources to assist reconstruction after such an event. In particular it was directed to financial planners, economists, and policy makers in those organisations.

It was also directed to businesses operating in Wellington whose ability to operate would be overturned by a large earthquake.

Finally, it was directed to emergency management and other organisations involved in coordination of reconstruction activities.

The objectives were to raise awareness of:

- the economic implications of a major disaster,
- the provisions already made by insurance companies, banks, and the government agencies involved in fiscal and monetary policy.

THE DISASTER MODEL

As in the previous seminars, the scenario adopted is the most probable very large earthquake (but not the largest potential earthquake) in the Wellington region, namely a Richter magnitude 7.5 event on the Wellington fault.

This would cause widespread damage in Wellington City and the Hutt Valley, with somewhat less damage throughout a broad region extending from Marlborough to the Manawatu.

According to the paper [2] presented by Bruce Shephard at the last seminar, there might be:

Households not habitable	17,680
Residential properties requiring inspection	142,000
Commercial properties requiring inspection	9,010
Potential insurance claims	245,000
Casualties: deaths 540, injured 2,571, hospitalised	1,357

The paper by John Savage [1], summarised at this seminar, covered the macroeconomic effects of this disaster, based on a computer model incorporating a simple analytical framework and data for New Zealand set against a background of international evidence.

This report finds that New Zealand's vulnerability to economic shocks, including one from a major earthquake, is high. However, its degree of institutional and economic responsiveness to shocks is also reasonably high. In the long term (over 5-10 years), the economic impacts tend to "wash out". In the very long term (10 years and beyond), there are no lasting effects on GDP. However, in the short to medium term, there are likely to be significant macroeconomic pressures.

In particular:

Capital stock. The 'mean value' probable maximum loss (PML) for this event would amount to destruction of around $10 billion of capital stock. The '90 percentile' PML would be around $20 billion. ('Mean value' has 50% probability and '90 percentile' a 90% probability of not being exceeded.)

Business interruption losses. In the short term (say, one year), losses due to the interruption of business could amount to over $1 billion.

Investment. New Zealand has a small open economy, and most capital losses are insured, so a major earthquake would initiate a strong investment cycle. This cycle - and its related price and output effects - would persist for some time. In terms of present value, the accumulated loss in net domestic product (NDP) would be roughly $2-3 billion under the mean loss scenario, or $9-11 billion under the 90 percentile loss scenario. The investment 'boom' following a quake would generate price pressures, particularly in the housing and construction sector.

Financial markets. In the immediate aftermath of the event, financial markets would be faced with uncertainty about the extent of damage and its market implications. There would be a number of conflicting pressures on interest rates and the exchange rate. Also, some institutions would face a deterioration of their balance sheets, and business confidence would be likely to decline. Consequently, initially, there would be significant short-term volatility in financial asset prices.

Monetary policies. Increased price pressures would provoke a monetary policy response that resulted in higher interest rates. Also, higher government debt and a larger balance of payments deficit would cause the risk premium on New Zealand financial assets to rise. The response of the Reserve Bank to increased inflationary pressures would eventually produce an appreciation of the trade-weighted index (TWI).

Fiscal position. There would be a significant deterioration of the fiscal position and of the underlying current account position.

THEMES

Unique event

Every earthquake is a unique event. In attempting to predict effects, the focus is usually on 'average' events. It is important to keep in mind that the distribution of possible events is extremely wide. Also, unique events can generate unique (and therefore unpredictable) economic responses. Given the state of our knowledge about earthquakes, and about the way the economy works, there is a high degree of uncertainty associated with such an event and its aftermath.

In discussion, the possibility of damaging aftershocks occurring for months after the main event was raised, and it was agreed that these papers were not attempting to give forecasts but rather to develop a broad perspective on which to base preparations. It was mentioned that reinsurers have traditionally defined an 'event' to have a time limit of 72 hours, which could be unrealistic. EQC is funding a study of time sequences of damaging earthquakes and aftershocks to clarify this issue.

Preparedness

In opening the seminar, the Rt Hon Bill Birch spoke of attitudinal preparedness, in which we should provide

constructively in advance for the expected disaster.

Chris Pinfield [3] said that the involvement of the Government in recovery from the earthquake is prescribed in the National Civil Defence Plan for Disaster Recovery. Under this, local authorities and enterprises are expected to manage their own risks, so their preparedness is in their hands. However, central government assistance is allowed for to ensure safety where it cannot be provided by local agencies, to provide extra social welfare if necessary, and to restore those facilities such as schools which it directly owns.

Under the Fiscal Responsibility Act, all fiscal risks over $10 million are identified, including the Government's obligations under this Disaster Recovery Plan and to EQC. Pinfield [3] showed that Budget forecasting revisions as large as $1 billion or so have not necessitated any alteration of the Government's fiscal programme, so the Government could be considered to be prepared in the sense that the large earthquake shock would probably not exceed some of the fiscal shocks it has been through without too much difficulty. Some recovery work would be expected to be covered by re-prioritising existing budgets, for example the Armed Services and some health costs.

It was affirmed by Bruce White [4] and the discussant of his paper, Brendan O'Donovan, that the banking industry in general has done considerable work on preparedness. The Reserve Bank in particular has made arrangements to maintain, for at least the first few weeks, (a) a critical core level of senior management (off site, if necessary), (b) communications links (by satellite), (c) power supply (back-up generator and fuel reserves), and (d) back-up sites and operating systems. The major banks have similar arrangements. All have sound balance sheets and prudent lending policies; they also have the advantages of being geographically diversified, mostly foreign-owned, and with major clients which are geographically diversified and multinational. Consequently they are well buttressed against the impact of a natural disaster, which, though significant, would be confined to a local scale, with the rest of the country expecting to carry on as usual.

With regard to financial markets, the Reserve Bank's priority would be to maintain the operation of markets and clearing systems to the greatest extent possible, using its newly developed, backed up, Exchange Settlement Account System. Knowing the media tendency to exaggerate, the Reserve Bank has developed a frame of reference to enable it to provide an appropriate sense of perspective on the disaster and has made it a priority to provide timely and accurate information to financial markets, using its satellite telecommunications system.

Starting points

The scenarios assume that New Zealand is in a reasonably healthy economic position prior to the event.

Economically, New Zealand's vulnerability is high because of the small, open economy with low diversification and a variable growth performance (especially compared with the rest of the OECD). On the other hand, the adverse effects of a quake would be much more severe if, for example, foreign debt was very high or the economy faced very tight capacity constraints.

As it is, a strong economy (especially a series of Budget surpluses) and a sound overall monetary policy provide the nation with a buffer against shocks, whether derived from economic turmoil in Asia, a major infestation of tussock moth, or a large earthquake. The Government's operating surplus has declined through its use to improve the state of its balance sheet and could go into deficit as a result of the earthquake, but a healthy balance sheet should enable it to withstand such temporary shocks. The balance sheet has also been improved by privatisation and corporatisation of Government assets and by state sector reforms. The net foreign currency debt is zero (February 1998), so there is no direct exposure to exchange rate shocks. (In Japan, the Kobe earthquake had no noticeable effect on their exchange rate.) The Government's target of reducing debt to 20% of GNP [5], expected to be reached in the next few years, will give it increased ability to cope, while private offshore debt, though high, is largely hedged and debt/equity ratios are very low.

John Balmforth [6] spoke of the solid insurance industry providing cover in Wellington. Most of the companies are foreign-owned, but all have suitable access to capital. Figures for the 15 largest companies show a sound level of shareholders' reserves and reasonable revenue growth and profitability. The industry has available to it and purchases substantial reinsurance from overseas sources. Members of the Insurance Council of New Zealand (ICNZ) are subject to regular solvency review, and all companies are credit-rated annually under the Insurance Companies (Ratings and Inspections) Act. Catastrophe response planning is ongoing, and the industry follows the Insurance Emergency Plan. ICNZ is developing a modern technology-based response system, The Insurance Emergency Response System (TIERS).

Reinsurance

The scenarios assume a high degree of reinsurance coverage, as is the case in New Zealand. According to Savage [1], in these circumstances, the costs of restoration suggested in the mean loss scenario would be borne by: EQC, $2.9 billion; New Zealand insurance companies, $0.8 billion; reinsurance, $6.1 billion; and households, $0.7 billion.

Martin Pyrke [7] estimated that about $5.5 billion of 'catastrophe excess of loss' cover is available to New Zealand and something like a further $4 billion in other types of reinsurance. Some of this could take a month or more to arrive.

The reinsurance market itself is now stronger than it has ever been [7], and reinsurers expect to be able to withstand at least US$50 billion market loss. It would take a 'string of major catastrophes in developed countries, possibly combined with a bond market collapse, to make unavailable the reinsurance funds...' needed for Wellington, which would be relatively small on a world scale. Reinsurance companies are security-rated, and many insurance companies will not accept security below an A rating.

There was mention by the discussant for the insurance industry papers, Craig Ansley, of the high premium for reinsurance and its implications in the theory of the probability of ruin; he suggested that, *prima facie*, self-insurance could seem to be an option for some circumstances.

In discussion it was pointed out that reinsurance was used to relieve volatility in the claims expenditure, and that the 'long-run' advantage of self-insurance was irrelevant if the company had gone bankrupt in the meantime. Earlier, Savage [1] had suggested that, if New Zealand insurers had no access to overseas reinsurance, the macroeconomic effects of the Wellington earthquake would be quite different. In particular, the negative effects resulting from lost assets would substantially dampen the GDP cycle, and the output losses (assessed as NDP) would be much larger - perhaps $9-11 billion (mean loss scenario). Also, in the absence of reinsurance, the impacts of 'debt overhang' (debt servicing costs) would need to be taken into account.

Resumption of business

The cost of business interruption can be enormous, and smaller businesses quickly close down without such essential services as electricity. The recent experience of the Auckland central business district has shown how vital even this one service is – without power, the computer systems are down, as are cash machines and eftpos; it has also shown how all services interact.

For business to be possible, all services need to be restored, and roads and the airport need to be open. Much of the economic impact on the city depends on businesses getting up and running with the minimum of delay. There was some doubt about whether businesses elsewhere would divert some resources to help the afflicted areas.

The effect of the disaster on the Government's tax take would also depend on how soon production could be resumed or relocated, as well as how much stock and equipment was written off [6]. The Government would have to ease fiscal policy for 2-3 years, then tighten it to recover the losses [5].

Relocation of business

Wellington is predominantly a service-based economy, with 80% of its business in this sector. This means it would be easy for business to relocate, compared with a manufacturing economy. If they were not already there, the banks and other businesses would transfer their centres of operations to Auckland or elsewhere, as would EQC and many of the organisations responsible for carrying on the business of government.

The assumption that this would be temporary was questioned by Ian McLean, who, on evidence from Northridge and Kobe, suggested that most of the fund managers would move to Sydney permanently, as might many other Wellington firms, two-thirds of which are Australian-owned.

Complacency

Professor Hal Cochrane, in providing an overview of the seminar [8], remarked on the need to guard against complacency through believing all aspects had been allowed for in the modelling and planning processes. The US insurance industry had computer simulations, which, however, greatly underestimated the damage from Hurricane Andrew and showed very low explanatory power for losses after the Northridge earthquake. The empirical basis for this 'seductive' technology is not necessarily sound.

Systemic risks

Professor Cochrane also raised the spectre of systemic risks, namely the insolvency of some banks or insurance companies, or indeed entire nations, acting like a contagion and precipitating wider financial dislocation. Although it remained contentious, he concluded that standard economic indicators have not always revealed macroeconomic instability, and systemic risks may be of concern.

Social effects

The focus of this seminar was economic losses. However, many (perhaps most) losses following a major quake are welfare losses, which are difficult to measure. Nor should mundane matters be ignored; for example, a consequence of a loss of power would be the breakdown of electronic equipment like computers, cash registers, ATMs, eftpos, etc., all leading to an inability by the public to access cash or bank balances.

A participant questioned the modelling assumption of positive behavioural responses, in particular people's reluctance to exploit the event. He also mentioned the need for skilled people and the stress and injury effects of the disaster on their ability to work.

For the insurance industry, there could be problems of: temporary housing of policy holders; fraud; and dealing with people who decide to relocate [5].

Whither now?

Ian McLean suggested that, rather than asking whether earthquake effects would be good or bad, we should focus on making sure that they mattered less.

There was probably no need for further broad initiatives on the financial implications of a disaster, although we should continue to refine the figures on an ongoing basis and should always use them with caution.

There were other areas in which further work needs to be undertaken, notably work on:

- social recovery,
- the development of new organisations and new legislation,
- lifelines, and
- business continuity.

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