

Preparing for natural disasters – where does the Reserve Bank fit in?

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In this article Bruce White discusses some of the issues that the Reserve Bank would need to address in the event of New Zealand experiencing a major natural disaster, for example a major earthquake centred on Wellington. The article stems from work undertaken within the Bank aimed at ensuring that it has an appropriate capacity to respond effectively to the issues that would arise in such a situation.

Executive summary

In recent years the Bank has been giving attention to the policy and operational challenges that it would face in the event of a major natural disaster – that is, one which might be thought to have the potential to cause material disruption to the New Zealand economy and financial markets. While such events are very infrequent, their unpredictability and the extent of the damage and disruption they may cause, means that it is important that a capacity to respond effectively in what would be a highly abnormal situation needs to be maintained.

Much of the Bank's thinking and disaster management capacity in respect of natural disasters is centred on a scenario involving a major earthquake in Wellington. This is because a Wellington earthquake is an event that we can one day be expected to have to cope with – seismologists assess the probability of such an earthquake (measuring between 7 and 8 on the Richter scale) occurring within the next 50 years at 20-25 percent. A Wellington-centred earthquake also provides a useful scenario for planning purposes since, with the Reserve Bank and many of New Zealand's major financial institutions headquartered in Wellington, it presents a combination of both operational and policy issues that would need to be contended with at the time.

A summary of the key points and principles that have been identified from the preparatory work that has been done follows:

- The Bank would have an important role in providing information to financial markets, including overseas markets. Back-up telecommunications systems, which can operate independently of the local telephone network, have been established for this purpose.
- Analysis of the economic cost of major natural disasters, in terms of both property damage and lost production, suggests that the effects, at the national economy level, could be quite significant but likely capable of being accommodated.
- Specifically, the effect on New Zealand's balance of payments could well be quite modest. This is because insurance and reinsurance transfers from overseas insurers could match the cost of the additional imports required to repair property, and any loss of export earnings. This being the case, it is not obvious that the "fundamentals" would change in a way such as to cause sharp adjustments to the exchange rate. If the exchange market did become highly unstable, and intervention was judged to be necessary, the objective of that intervention would be to assist the market to re-establish more orderly conditions, rather than to defend a particular exchange rate.
- A major disaster would likely see upward pressure go onto the prices of some goods and services, such as, for example, construction costs. Possibly offsetting this would be some downward pressure on the prices of those goods and services for which demand would likely fall for a period. Also, at least part of the initial spike-up in prices would likely be only temporary: as the supply of items in short supply was re-established, or responded to meet the increased demand, prices could be expected to fall back toward pre-disaster levels. Nonetheless, overall there would likely be an initial positive shock to the price level, albeit of a magnitude that could be relatively modest on a nationwide basis. The (inflation) Policy Targets Agreement under which the Reserve Bank operates provides for such a price level shock to be accommodated, subject to the proviso that monetary policy should ensure that it does not spill over into generalised inflation.
- With respect to financial markets and the financial system, the Reserve Bank's priority would be to maintain the operation of markets and of clearing systems to the greatest extent possible. To this end, considerable

attention has been given to disaster recovery arrangements during the development of the new Real Time Gross Settlement system for high value payments in New Zealand, which is expected to commence operation in early 1998. Also, analysis of the ways in which a natural disaster could impact on banks' balance sheets suggests that there should be little cause for any loss of confidence in the solvency of banks.

I Natural disasters – their relevance to New Zealand economic policy

New Zealand is exposed to a range of different kinds of natural disasters, including storms, floods, volcanic eruption and earthquakes. The last-mentioned probably feature more in our consciousness than the others because of the tremendous havoc earthquakes can cause, and the fact that, because New Zealand lies on the boundary of the Australian and Pacific tectonic plates, it has a history of major earthquakes. Over the last 150 years, New Zealand has experienced 19 earthquakes in excess of force 7 on the Richter scale, although there have been only three in the last 50 years and, fortunately, those were centred away from major urban areas, so damage was relatively modest. Strict building codes in New Zealand have also been a factor in limiting damage from a larger number of more moderate earthquakes.

Our geological location also explains New Zealand's volcanic history. While the return frequency of major volcanic eruptions is much lower than has been the case for major earthquakes, the eruptions of Mount Ruapehu in 1995 and 1996 gave a timely reminder of the fact that none of the volcanoes scattered over the northern half of the North Island are extinct. The recent eruptions of Mount Ruapehu also provided a glimpse of the sort of economic havoc a major eruption could cause. Although Mount Ruapehu is located in a relatively remote region, and thus the direct economic damage was limited mainly to the small communities nearby which service the local ski fields and farming districts, ash discharges nevertheless disrupted New Zealand air space for some weeks. It is not difficult to visualise how the circumstances would be very different if, for example, one of the Auckland volcanoes were to re-awaken, or even just show significant signs of re-awakening.

This article reports on work that has been undertaken within the Reserve Bank aimed at ensuring that we have a reasonable capacity to respond effectively and appropriately, in our particular areas of responsibility, should New Zealand experience a major natural disaster. It may seem surprising that this issue receives the attention of a central bank. But when central banking is considered in the context of an overarching responsibility for maintaining a stable and well-functioning monetary system, it is clear that in the period of uncertainty and stress following a major natural disaster the central bank will be faced with significant challenges.

Beyond that, it is the very infrequent, possibly less than "once in a life-time", shocks to the system which can present particular difficulties. Another example of this sort of "shock" – and one that the Bank also maintains a capacity to respond to – would be a major bank failure.

A further reason for giving the subject of natural disasters some attention stems from the nature, size and structure of New Zealand's economy. New Zealand, unlike larger economies such as Japan and the United States (which are also vulnerable to earthquakes and volcanic eruption), is a small and relatively undiversified economy. This means that New Zealand's ability to absorb the economic shock that can be caused by a natural disaster may be that much less. At the same time, the New Zealand economy is relatively developed – particularly in terms of the degree to which its monetary system and financial markets are internationally integrated. These two considerations, taken together, suggest that natural disasters have a potential to present economic policy agencies – and in particular the Reserve Bank – with a more complicated set of issues to manage than might be the case in many other countries. To be sure, other small countries, such as the small island states of the South Pacific, are perhaps more exposed to economic damage from natural disasters, given that in those countries a hurricane can wipe out a good part of a year's export earnings and more in the space of a day or two. But in those countries, the financial sector is less developed, and less integrated with financial markets abroad, which makes the management task for the monetary authorities perhaps simpler – but the disaster no less costly – than will be the case in New Zealand.

The remainder of this article is organised as follows. Section II elaborates on the nature of the Reserve Bank's interests and responsibilities in relation to natural disasters. Section III attempts to put the issue in perspective by sketching the sort of scenario that can be expected to occur some day – a major earthquake centred close to Wellington. Section IV discusses the implications for monetary policy, with particular reference to the (inflation) Policy Targets Agreement between the Governor of the Reserve Bank and the Minister of Finance. Section V outlines some issues relating to the implications for the financial system, and Section VI draws some conclusions.

II Where does the Reserve Bank fit in?

The Reserve Bank's role as guardian of the New Zealand monetary system comprises three strands:

- operating monetary policy so as to maintain price stability, that is, to maintain sound money;
- promoting the maintenance of a sound and efficient financial system;
- issuing of currency.
- maintenance of communications links. While a major disaster in Wellington might immobilise the Wellington economy and financial sector, the rest of New Zealand, and the rest of the world, would carry on. It would, therefore, be important that the Bank be able to communicate with “the rest of the world” – for example, with the Auckland market (through the Bank’s Auckland office), with overseas markets (likely through relevant overseas central banks) and with the financial wire services. To ensure that this communication capacity can be maintained, the Bank has a small back-up telecommunication facility which, in emergencies, can operate independently from the local telephone network (via satellite);

It should be noted that the implications for the Bank would be very different as between a disaster centred on Wellington – where it and a majority of the major financial institutions are headquartered – and one in another major urban area. In the former case, the Bank would need to contend with potentially serious disruption to its own, and to other financial institutions’, head office and wholesale market capabilities, as well as with the wider financial market and economic implications. By contrast, a major disaster centred elsewhere – say volcanic activity in Auckland – may be a simpler scenario for the Reserve Bank to respond to, but probably of greater consequence in terms of the economic impact. For the purposes of this article the central scenario is taken to be a major earthquake centred on Wellington, because such a scenario exposes the full range of operational and policy challenges that the Bank would need to deal with.

In much of our thinking about the sorts of capacity we need to have to be able to respond effectively to a Wellington-centred earthquake, we have focused on what the pressing demands would be in the first week or two immediately following the event. It is during this period that:

- many staff would be either unavailable for work, or unable to get to work;
- the Bank’s head office building may be unoccupiable or, if occupiable, without essential services (electricity and water supply, sewerage connection, telecommunications links etc);
- there would likely be widespread uncertainty, locally and abroad, about the nature and extent of the disaster, about what it means for New Zealand’s financial markets, including whether they remain “open”, and about the economy more generally.

Against this back-drop, the main *short-run* operational priorities for the Bank have been seen as falling into the following areas:

- maintenance of a critical level of senior management capacity, recognising that the normal complement of senior management may not be in a position to perform normal duties;

- back-up power supply for the Wellington head-office building. The Bank has a back-up generator in the basement of the building, and maintains fuel reserves sufficient for it to run for several weeks;
- back-up sites for the operating systems the Bank provides for the financial system. These operations comprise exchange settlement accounts across which the banks settle each day’s banking business, and Austraclear, the principal system in New Zealand for settling securities market transactions. The nature of the back-up arrangements for these systems is discussed further in section V which discusses financial and payments system related issues.

More generally, the Bank backs up its computer records to an Auckland site as a matter of daily routine. Also in an emergency, if the circumstances required, it would be possible for the Bank temporarily to re-locate a handful of key people to an alternative site from where critical policy and operational functions could be conducted.

It is also considered important that those who may be thrust into a crisis management role give some prior thought to the sorts of situations they might be expected to deal with. This is not an area in which it makes sense to develop detailed plans. But if the broad nature of the issues which would need to be dealt with can be identified and thought about beforehand, then it is more likely that the judgments required to be made at the time, in what would be a highly abnormal set of circumstances, would be in the right domain. The Reserve Bank has a role here, both in preparing itself for such a set of circumstances, and in prompting others in the financial markets to do the same.

III Informing the markets

In the case of financial markets, the immediate demand following a major disaster would most likely be for infor-

mation. Initially it simply would not be possible for the Bank to provide all or much of the information that markets would ideally like to have. Before anything approaching an accurate assessment of the impact of a major disaster on the economy, on the government's accounts, or on inflation – and hence the stance of monetary policy – would be able to be given, a fair bit of fact gathering and analysis would be required. Having said that, it is well known that markets abhor a vacuum, and if supplied with no information tend to “fear the worst”, possibly much worse than is warranted. Therefore, even if the first information that can be given is only about the extent to which the financial system is still operational, the approach the Bank proposes to adopt, and the time-frame within which it is expected further information will be provided, that would help lessen uncertainty and contribute to the maintenance of stability.

It is also to be expected that soon after news of the disaster is broadcast, financial institutions – at least those located outside of Wellington – would be making assessments of what it means for the New Zealand economy and will be reviewing their investment and trading strategies on the basis of those assessments. Even though a reasonably complete assessment of the situation would probably take weeks, or months, to complete, that would not alter the fact that those who can would make decisions which affect New Zealand's financial markets more or less immediately – using the best information available, no matter how imprecise or incomplete it is. Some may choose to withdraw from the market temporarily,

which could cause markets to become quite “thin”, in which case a small number of large transactions could cause financial market prices, like interest rates and the exchange rate, to move quite sharply.

One thing that can be done to lessen the degree of volatility and instability in the financial markets in the event of a major disaster is to develop, ahead of time, a frame of reference that might help those first “best guesses” come out in the right ball-park, and thereby assist the development of an appropriate sense of perspective on the situation.

The following sketches the sort of framework that might be useful – drawing heavily on a recent study undertaken by John Savage of the New Zealand Institute of Economic Research for the Earthquake Commission.¹ Based on an assumed earthquake centred on Wellington of 7.5 on the Richter scale, this study estimates the cost of replacing damaged capital stock in the Wellington region could be as set out in Table 1.

As emphasised by Savage, the numbers need to be interpreted with caution. They are no more than indicative for one plausible scenario, and do not represent a prediction – not least because the destructive force of an earthquake varies considerably according to where precisely it is centred, its depth, and which faults rupture, as well as its magnitude as measured on the Richter scale. Thus, for a given base scenario, there can be quite a wide range of

Table 1

Wellington region^(a) capital stock

Current replacement	Damage estimate ^(b) value	
	(NZD billion)	(NZD billion)
Business plant and machinery	4.3	0.7 - 1.4
Business sector buildings	20.6	3.5 - 7.0
Private infrastructure	5.9	0.5 - 1.1
Public infrastructure	4.7	0.6 - 1.2
Residential dwellings	15.4	2.0 - 4.1
Residential contents	<u>7.7</u>	<u>1.3 - 2.6</u>
Total	<u>58.6</u>	<u>8.6 - 17.4</u>

(a) The Wellington region is defined as comprising Wellington City, the Hutt Valley and Porirua City.

(b) The lower and upper amounts correspond with 50 percentile and 90 percentile estimates of the cost.

1 Refer to John Savage, “Economic Effects of a Major Earthquake”, Report for EQC, New Zealand Institute of Economic Research Contract No. 1008, April 1997.

outcomes. The estimates given amount to nearly 10 percent to 20 percent of New Zealand's annual GDP, and about 50 percent to 100 percent of a year's total gross investment.

These estimates also provide a starting point for assessing the potential implications for the government's accounts and the balance of payments. On the basis of the above scenario, the direct cost to the government from replacing damaged property could be in the order of NZD3.5 billion – 8.0 billion. The largest part of this cost reflects the earthquake damage compensation the government provides to homeowners, via the Earthquake Commission (EQC). The balance represents the cost of repairing government buildings and other property, and the government's obligation to contribute to the cost of repairing essential infrastructure owned by, but not able to be insured by, local government. The government has committed to meeting 60 percent of the latter costs.

Through the EQC, the government covers the cost of damage to *insured* residential dwellings on a replacement cost basis, up to NZD100,000 per dwelling, plus similar compensation for damage to home contents up to a maximum of NZD20,000². On the basis of the scenario outlined above, it is estimated that EQC claims for the Wellington region could total between NZD 3 billion and NZD 7 billion, with the cost borne by homeowners, as the result of the excess and non-insurance perhaps being around NZD 0.7 billion.

The balance of the cost of property damage would fall on the private business sector, either private sector insurance companies (to the extent that the property was insured) or directly on property owners. Note, however, that it appears that a substantial proportion of the earthquake risk carried by local insurance companies is re-insured overseas, in which case much of the cost would be borne by non-residents (or viewed alternatively, there would be a pay-back in respect of the premiums paid to reinsurers during the preceding years). This is a salient point in respect of the implications for the balance of payments, which are discussed later in this section.

The EQC currently holds investments to cover its risk amounting to about NZD 2.6 billion. These have been

2 Private house and contents insurers in New Zealand have generally not covered earthquake damage. However, some private insurance company policies include earthquake cover in respect of the difference between the EQC maximum payout and the amount for which the house is insured privately against other risks. EQC cover is subject to an excess of the greater of NZD200 or 1 percent of the claim in the case of houses and contents, with a greater excess in respect of residential land damage claims.

accumulated from annual levies payable by homeowners, and from investment income. The investment portfolio is supplemented by re-insurance from overseas insurers amounting to NZD 1 billion, and a government guarantee which covers any remaining obligations.

The economic cost to the government as the result of claims on the EQC would comprise the reduction in the net worth of the Commission, plus the amount of any claims made under the government guarantee. This cost would be reflected in an increased call by the government on the capital markets, either as the result of the EQC selling its investments (almost entirely public sector securities) directly into the market or back to the government. In the latter case, the government would need to expand its borrowing programme to raise the additional funding required (plus more if the government guarantee of the Earthquake Commission's obligations were called on).

A variety of funding options would be available to the government: less domestic borrowing, foreign currency borrowing, or liquidation of official foreign currency reserves. Decisions on which funding strategy would be most appropriate would be a matter to be determined at the time, in the light of market conditions in alternative markets.

The government, of course, would incur other costs, for example, increased health and welfare expenditures. Also, in the short run at least, there would be reductions in tax revenue as the result of temporary cessation of business, business asset tax write-offs (net of insurance receipts) and a likely short-term fall in retail turnover and thus in GST³. It is difficult to provide even ball-park estimates of these costs to the government's finances, but provided the disaster were reasonably localised, they should be relatively less substantial than the costs resulting from property damage. For instance, assuming a figure of NZD 3000 per capita for the whole of the greater Wellington metropolitan population implies a cost to the government

3 The longer term impact on the economy is beyond the scope of this article. Briefly though, once the reconstruction effort gets into full swing, a period of stronger economic activity is likely, although still further out, another cyclical down-swing is possible. The latter is because the reconstruction phase will effectively bring forward investment which would have taken place over a more extended period, resulting in a lull following the post quake pick-up. On the other hand, the bringing forward of investment can be expected to contribute to a shift up in the productivity of the capital stock, given that the reconstruction phase will provide an opportunity to introduce new technologies (in buildings, plant and equipment) ahead of what would otherwise have been the case.

of about NZD 1 billion. This suggests a mid-point estimate of the **total** cost to the government of, say, NZD 6 billion, with an upper range estimate of say NZD 9 billion. To put this in perspective, the government's total debt, as at 30 June 1997, was NZD 26 billion, which in turn was NZD 12.4 billion less than five years previously. A one-off increase in government net outlays of the sort of magnitude suggested above, with no offset from increased taxes, therefore, might reverse between one half and two thirds of the progress that has been made in reducing the government's debt during the last five years. This suggests that the fiscal cost of the sort of disaster envisaged should be manageable.

Having said that, it should be underscored that this reasonably sanguine assessment of the fiscal implications is importantly dependent on the level of government debt and/or the tax burden being not already high prior to the disaster. If there were little room for manoeuvre on the fiscal position, either tax rates would need to be increased for a period, or, if the government preferred to borrow, the risk premium on government debt, and thus in interest rates more generally, would rise. In these circumstances, borrowing, as a means of spreading the burden, to avoid the efficiency and disincentive costs of higher taxes, might not be as attractive an option as it would be if the debt starting point were more favourable. The corollary to upward pressure on interest rates might be public pressure for monetary policy to be more accommodat-ing even if that were to mean more inflation.

How the Bank would most appropriately manage monetary policy in the period following a major disaster is something which is discussed later in this article, but it suffices to say here that if one of the problems caused by inflation is uncertainty, then it is not obvious that backing away from the Bank's low inflation objective would help reduce uncertainty about the economic outlook. To be sure, it may prove necessary for monetary policy to accommodate a one-time shift in the average level of prices caused by temporary shortages, but it would be important to prevent this from developing into an on-going inflation problem. In this regard, New Zealand's experience following the oil shocks of the 1970s is instructive. Though not natural disasters, the oil shocks had the effect of causing an abrupt and significant reduction in the real income of New Zealanders. The macro policy, including monetary policy, response on that occasion was to try to offset the real economy impact. But the result ended up being more – and more persistent – inflation. From that experience, it is clear that allowing any initial shocks to the price level to develop into on-going inflation does not provide a way of avoiding the loss of real income. Inflation may disguise, and reallocate, the real cost, but it cannot bring back what has been lost.

From the above indicative data on the cost of damage to property, it is also possible to obtain a ball-park idea of what the *direct* impact on the balance of payments and external debt might be. If the import content of the cost of replacing/repairing damaged property were, say, 40 percent of the total cost, then the external trade balance might be expected to deteriorate, in aggregate, by NZD 3.5 billion - 7 billion. Export income, at least in the case of a Wellington earthquake, should be relatively unaffected, since the Wellington region is not a major export producing area, and the hinterland serviced by the Port of Wellington would readily be able to ship from alternative ports if that were required. Overall, New Zealand's external *trade* balance as a percentage of GDP might deteriorate by up to, say, 2 percentage points for a period of 2-3 years.

Offsetting this deterioration in the trade balance would be an inflow of insurance and re-insurance transfers. Indications are that these could match, or even exceed, the increase in net imports, in which case the current account balance on the balance of payments could actually *improve*.

In a sense, by re-insuring abroad, New Zealand has been "pre-paying" the cost of a major natural disaster, such that when it occurs the net effect on the external accounts should not be particularly adverse. This is an important point given that our "initial external position", at least currently, would comprise a current account deficit equivalent to 6.4 percent of GDP (recorded for the year to June 1997), and a total (net) external debt to GDP ratio of about 80 percent. Both these ratios are quite high by international standards. It might be thought, therefore, that superimposing a trade balance shock of the magnitude envisaged above would quite possibly be sufficient to force sharp adjustment. However, such a view would reflect only a partial view of the situation, and in particular would ignore the net transfers from abroad from re-insurance claims.

This section has focused mainly on the Reserve Bank's role in providing financial markets with *information*, rather than on what the Reserve Bank might see as being the appropriate financial market, ie, interest and exchange rate, responses. This approach reflects a view that interest and exchange rates are variables that should be left to adjust flexibly to the new circumstances. Thus the Bank's priority, beyond providing information as and when it can, would be to keep financial markets functioning to the greatest degree possible. This may include, in the very short run, providing additional liquidity to enable settlements at risk of failing to be settled. Also, the Bank might need to consider whether the circumstances exist to justify participating in the foreign exchange market. This might be the case if, for example, other foreign exchange

dealers had withdrawn from the market, causing it to become excessively thin and exchange rates highly unstable. But the Bank's purpose in intervening in the exchange market would be to support "the market", not to defend a particular exchange rate. In other words, the Bank would be looking to help the market find a new trading range for the exchange rate and once "two-way" trade were re-established, would look to withdraw.

IV Maintaining price stability

The conduct of monetary policy by the Reserve Bank is governed by the Policy Targets Agreement (PTA) between the Minister of Finance and the Governor of the Bank. This agreement establishes an inflation target range of 0 to 3 percent per annum, but also identifies some circumstances where it is envisaged that inflation may appropriately go outside the target range. One such situation is the occurrence of a significant natural disaster.

What the PTA is recognising here is that a significant shock like an earthquake might result in a range of specific, completely unanticipated, price increases. In the short run the prices of some goods and services could be expected to rise, although there may be offsetting price reductions as the result of excess supply elsewhere in the economy. Also if the short-run impact on the exchange rate were a depreciation, there would likely be some pass-through of higher NZD prices for imports and exportable commodities (such as, for example, meat and dairy products) into local consumer prices. Rents in the area affected would also probably jump sharply, as would construction costs. Given the prevailing stance of monetary policy ahead of the disaster, when these price shocks will not have been anticipated, the likely result will be a near term jump in the average level of consumer prices.

It is also recognised that even if monetary policy were tightened aggressively immediately following the disaster, it would not be possible to achieve sufficient restraint on prices overall to enable the specific price increases to be accommodated in an unchanged average level of prices, at least, not without significantly suppressing the level of real economic activity. Moreover, in the circumstances, an aggressive near term tightening of monetary policy would probably be a wrong response for another reason: uncertainty and possible stress in the financial system would more likely make it appropriate for the Bank, in the very short run, to be erring on the side of standing ready to provide the financial system with additional, not less, liquidity.

The PTA also requires, however, that the Bank conduct monetary policy in a way which would prevent *general*

inflationary pressures from emerging, and to ensure that the effect of such a shock on the inflation rate would be *transitory*. In broad terms, these provisions suggest that it is just the direct or "first round" effect of the disaster on the price level which should be accommodated.

Translating this general principle into practice would involve judgement, particularly on where the direct price level effects end, and indirect, or second round effects begin. For example, in the case of an earthquake in Wellington, there would almost certainly be an increase in construction costs in the Wellington area. There would likely also be an increase in construction costs in other regions, since firms in those other regions would face greater competition from Wellington firms for appropriately skilled labour and the materials required. And an increased demand for labour with the skills required by the construction industry would see other industries which require broadly the same skill set respond by also increasing pay rates, with a view to passing on the costs. And those to whom the costs would be passed on might be expected, in turn, to seek to pass on the higher costs a stage further – including employees seeking to pass the higher "cost of living" on to employers. Clearly, if totally accommodated by monetary policy, this sort of process would result in generalised inflation, rather than the necessary shift in relative prices.

The issue facing the Bank would be the extent to which the necessary relative price changes occur through increased prices of specific goods and services, versus a fall in the average level of all other prices. The way the Bank would likely do its arithmetic would be to estimate the size of the one time shift upwards in the general level of prices that would be sufficient to accommodate relative price increases attributable *directly* to the earthquake, but no more than that. This is not to suggest that the Bank can "regulate" which prices adjust and which do not: but rather that monetary policy would provide only so much accommodation. It would be for market forces to determine, within the scope of that accommodation, what actually happened in terms of the balance between the prices of some things going up, and others going down.

While many uncertainties surround the nature and extent of the likely pressures on the price level, it is possible to develop a sense of perspective on this issue too by working through some plausible, if hypothetical, scenarios. Savage in his study does this by considering three scenarios:

- Scenario 1 assumes that Wellington construction and other housing costs rise by 10 percent. These increases remain localised to the Wellington region. Other prices are unaffected. In this case, the CPI increases by 0.2 percentage points more than it would otherwise.

- Scenario 2 assumes that Wellington construction and housing costs rise by 25 percent and most other prices by 10 percent. All the price rises remain localised. In this case, the CPI would rise by 1.3 percentage points more than otherwise.
- Scenario 3 assumes construction and other housing costs rise by 20 percent throughout New Zealand. Most other prices rise by 5 percent but remain localised. In this case, the increase in the CPI would be 4.3 percentage points.

These estimates are arrived at simply by weighting the assumed quake-related (“specific”) price shocks according to the relevant weights in the CPI regimen. They take no account of the effect of any change to the exchange rate on the price level, nor the effect of any monetary policy response. But they do provide a sense of perspective on how material the direct price level effects on a New Zealand wide basis might be. If the central scenario above is seen as being representative, then it seems possible that the inflation effect might not be all that large, and that if monetary policy were successful in containing the inflation pressures to the “first round” effect, the one time lift in the price level would not result in all that much change to the inflation environment or inflation expectations.

A range of other considerations support this general conclusion.

- First, it is possible that, on equity grounds, the government will for a period wish to ration some essential goods, like food, in which event official prices for these goods may not increase much.
- Second, and related to the rationing point, it is possible that sellers of goods and services would, to some degree at least, forego the opportunity to raise prices to the level the market would bear – to avoid the risk of reputational damage from being seen to exploit the situation. This has been the experience in some overseas disaster situations.
- It is likely that some of the impact on the price level will be only temporary. Once basic services, such as transport services, are restored it is possible that some of the initial local spike-up in the prices of goods and services would be reversed.

V Implications for the financial system

A major disaster potentially could disrupt or destabilise the financial system in at least two ways.

First, the ability of financial institutions, other commercial firms and individuals to access their bank accounts for the purpose of making payments would be impaired, at least in the region directly affected by the disaster. Wholesale market settlement systems and retail EFTPOS and ATM links would likely be cut. Maintenance of bank treasury dealing and branch operations would also depend on the electricity supply being maintained/restored. In the absence of electricity supply, bank branches would face difficulties in accessing customer account (electronic) records and in maintaining security, and thus would likely need to close, or operate on a restricted basis.

Secondly, it is possible that the solvency of some banks would, in the public’s mind become doubtful, given that banks’ borrowing customers’ cash flows would have been adversely affected by the disaster, and that property collateral would have been damaged. Concerns in this respect, however, can be overstated. There are a number of reasons for thinking that banks’ balance sheets, if sound before the earthquake, would remain sound afterwards:

- most New Zealand banks are geographically diversified, meaning that only part of their balance sheet is exposed to any single natural disaster (although this could be quite a large part if a natural disaster were to occur in the Auckland region);
- many firms that borrow from banks are themselves geographically diversified, eg, the national and multinational companies. And in the case of those companies whose cash flows, and assets pledged as collateral for bank loans, are damaged, an additional buffer of security would be provided where there is commercial property insurance and business interruption insurance;
- additionally, most New Zealand banks are owned by an international parent, which would have a strong incentive to provide financial support to the New Zealand banking operation, if required.

Taken together, the above factors suggest that the solvency of the New Zealand banking system is well buttressed against the effects of a natural disaster.

With respect to the payments system, it seems likely that maintaining continuity of payments services *outside* the disaster area will likely prove to be the more pressing requirement. A disaster of the severity envisaged would probably bring much local commerce and industry to a halt, but the rest of New Zealand, and the world, will want, and need, to carry on. It will be important that payments systems have a capacity to facilitate that.

This issue can be thought about at three levels:

- wholesale/high value payments, for example foreign exchange and securities market settlements;
- retail payments, some of which may be high value; and
- cash transactions.

These different categories of payment are processed in different ways, and disruption to them would have different implications.

Foreign exchange and securities market settlements are mostly processed through dedicated systems – KITS (Kiwi Interbank Transfers System) for foreign exchange transactions, and Austraclear for securities market settlements. Both these systems have primary sites in Wellington and back-up sites in Auckland which would take over in the event of the Wellington site being immobilised.⁴ The new Exchange Settlement Account System (ESAS) currently being constructed to facilitate Real Time Gross Settlement (RTGS) from early 1998 will also have a back-up capacity located in Auckland. The Reserve Bank also runs an electronic registry for government and a range of other financial market securities. Registry records are backed up off-site daily, but a back-up operating capacity is not maintained off-site. However, the majority of the securities in question have been lodged into the Austraclear depository, where trades could continue to be settled.

These arrangements provide a core contingency structure for the wholesale market, and work undertaken in the context of introducing RTGS to New Zealand's wholesale markets has included a focus on this area. The move to real time settlement and increased reliance on high value electronic systems will make a very substantial contribution to reducing financial settlement risks in the New Zealand financial system, but it is recognised that it also increases the vulnerability of those systems to physical disaster. Moreover, wholesale payments systems will continue to evolve, making for an on-going need for the proprietors of those systems, and the participants in them, regularly to check cross-system back-up compatibilities and linkages.

Retail payments by cheque and various forms of retail electronic payment, eg, telephone banking, direct credits and direct debits, desk top banking, and internet banking services are processed by systems owned co-operatively by the banking industry, and operated under contract by a

data processing firm at sites located in Auckland and Wellington. These sites operate independently from each other, ie, if one were put out as the result of a disaster, the other could still function.

Thirdly, cash transactions. Obviously, there will be no impediments to people making payments by cash. But some difficulties can be expected in obtaining *access* to cash. ATMs and EFTPOS systems are dependent on electricity supply and telecommunications links, and obtaining cash from “over the counter” at a bank would be subject to banks being able to confirm customer account balances. It is likely, therefore, that for a period, in the disaster affected area, public access to cash may be restricted. This, however, needs to be viewed in the context of the circumstances. In the very short run following a disaster of a magnitude which would immobilise the retail banking system, the need for the public to make payments is likely to be low: the main priority will be attending to emergencies, with the civil defence authorities playing a key role in distributing emergency rations of food, medical services and the like. For the first few days at least, in the area most adversely affected, getting access even to cash is likely to slip down the list of priorities. And within a relatively brief period limited electricity and telecommunications services should be re-established, so that a basic level of banking service for the public would be available from some premises. Overseas evidence on major earthquakes indicates that basic electricity and telecommunications links generally can be restored within days of the earthquake.

The Reserve Bank's primary role in relation to the supply of currency is as a “wholesaler” to the banks: the Reserve Bank does not provide currency direct to the public. Thus, so far as Reserve Bank contingency planning in relation to currency supply is concerned, the key is decentralised storage, so that should any one of the Bank's buildings become inaccessible, the banking industry's currency requirements could be met from another. The Bank covers this requirement by holding stocks of currency in Auckland, Wellington and Christchurch, in sufficient quantities at each so that should it not be possible to meet the needs of a region from the local site, they could be covered from the supplies held at another.

VI Conclusions

At the time a disaster occurs, the authorities will be faced with a multitude of uncertainties and highly abnormal situations. One of the critical initial requirements will be to put the event into a proper perspective and to respond in some order of priority to what could seem an overwhelming set of immediate demands.

4 From early 1998 the primary site for KITS will be in Auckland, with a back-up site in Wellington.

This article has outlined some of the issues that have been addressed within the Reserve Bank, as part of an effort to ensure that the Bank has an adequate level of preparedness to respond effectively in its areas of responsibility. By way of conclusion, it is perhaps worth listing the key points that would guide the Bank's approach in such a situation.

- The Bank would have an important role in providing information to financial markets, including overseas markets. Back-up telecommunications systems, which can operate independently of the local telephone networks, have been established for this purpose.
- Analysis of the economic cost of major natural disasters, in terms of both property damage and lost production, suggests that the economic effects, at the national level, could be quite significant but likely capable of being accommodated.
- Specifically, the effect on New Zealand's balance of payments could well be quite modest. This is because insurance and reinsurance transfers from overseas insurers could match the cost of the additional imports required to repair property, and any loss of export earnings. This being the case, it is not obvious that the "fundamentals" would change in a way such as to cause sharp adjustments to the exchange rate. If the exchange market did become highly unstable, and intervention was judged to be necessary, the objective of that intervention would be to assist the market to re-establish more orderly conditions, rather than to defend a particular exchange rate.
- A major disaster would likely see upward pressure go onto the prices of some goods and services, such as, for example, construction costs. Possibly offsetting this would be some downward pressure on the prices of those goods and services for which demand would likely fall for a period. Also, at least part of the initial spike-up in prices would likely be only temporary: as the supply of items in short supply was re-established, or responded to meet the increased demand, prices could be expected to fall back toward pre-disaster levels. Nonetheless, overall there would likely be an initial positive shock to the price level, albeit of a magnitude that could be relatively modest on a nationwide basis. The (inflation) Policy Targets Agreement under which the Reserve Bank operates provides for such a price level shock to be accommodated, subject to the proviso that monetary policy should ensure that it does not spill over into generalised inflation.
- With respect to financial markets and the financial system, the Reserve Bank's priority would be to maintain the operation of markets and of clearing systems to the greatest extent possible. To this end, considerable attention has been given to disaster recovery arrangements during the development of the new Real Time Gross Settlement system for high value payments in New Zealand, which is expected to commence operation in early 1998. Also, analysis of the ways in which a natural disaster could impact on banks' balance sheets suggests that there should be little cause for any loss of confidence in the solvency of banks.