# Labour cost escalation in Canterbury

## Forecasts

NZIER report to the Commerce Commission

July 2013

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# Authorship

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# Key points

- Construction labour costs in Canterbury are forecast to rise by 2.5% more than economy-wide cost inflation, on average, until 2017.
- The protracted labour cost premium reflects a protracted rebuild lasting until 2020.
- Cost escalation of 6% in March year 2017 turns into 2% cost deflation in March year 2018 after which labour costs will continue to decline towards national average wages.
- The key point of sensitivity in the forecast is buyers' willingness to pay or delay in the face of cost escalation.
- More rapid cost escalation is possible (as is slower cost escalation) but would be accompanied by more rapid cost deflation occurring sooner than we are forecasting – the faster the rise the sooner and faster the fall.

### Labour costs: actual and NZIER and Orion projections

Annual average of index and annual average % change

| | Index | | | Annual average % change | | |
|---|---|---|---|---|---|---|
| | Construction LCI - Canterbury | | All industries LCI - NZ | Construction LCI - Canterbury | | All industries LCI - NZ |
| **March years** | Orion forecast | NZIER forecast | NZIER forecast | Orion forecast | NZIER forecast | NZIER forecast |
| 2011 | 1028 | 1028 | 1023 | 2% | 2% | 2% |
| 2012 | 1067 | 1067 | 1044 | 4% | 4% | 2% |
| 2013 | 1103 | 1103 | 1063 | 3% | 3% | 2% |
| 2014 | 1185 | 1144 | 1091 | 8% | 4% | 2% |
| 2015 | 1274 | 1195 | 1112 | 8% | 5% | 2% |
| 2016 | 1370 | 1261 | 1141 | 8% | 5% | 3% |
| 2017 | 1438 | 1339 | 1166 | 5% | 6% | 2% |
| 2018 | 1510 | 1307 | 1191 | 5% | -2% | 2% |
| 2019 | 1586 | 1269 | 1217 | 5% | -3% | 2% |

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# 1. Introduction

This report describes our forecasts of construction related labour cost escalation for the Canterbury region.

The forecasts build on findings in a previous NZIER report that reviewed labour cost escalation forecasts proposed by Orion. The review considered past New Zealand and international experience of inflation following surges in construction demand. The conclusions of that review were:

- a sustained period of 5%-7.5% wage inflation, as forecast by Orion, would be unprecedented for New Zealand and internationally
- a surge in wage inflation should be expected and to some extent has already been observed but near term wage inflation of 7.5% is high by New Zealand and international experience and is large relative to experience of Canterbury construction labour costs to date
- it is extremely unlikely that such high levels of inflation would persist since
  - international experience of natural disasters shows an initial spike in costs in the first 1-3 years after a natural disaster, followed by deflation
  - regional economic booms in New Zealand that are out-of-sync with the national average show an initial price spike followed by deflation towards the national average.

The analysis contained in this report extends the previous analysis by conducting forward-looking modelling of cost escalation dynamics in the construction sector in Canterbury. The results of this modelling have been used to produce our forecasts.

Our forecasts, presented in section 2 are for a reasonably protracted period of labour cost inflation in the construction sector in Canterbury. International experience suggests that if rapid inflation was to occur Canterbury would have experienced higher increases to date.

The scale of reconstruction in Canterbury suggests that cost escalation will rise at unprecedented levels from a New Zealand perspective, though this assumes that buyers will be willing to pay accordingly.

The analysis behind our forecasts focuses on the timing of cost escalation and interplay between labour supply, planned construction volumes, desired construction timeframes and, implicitly, willingness to pay or delay in the face of cost escalation.

The reason for this focus is the observation that cost escalation, above national norms, cannot last forever. We have addressed questions of both rate of escalation and timing of decline and find the answers to be negatively related – the faster the rise the sooner the fall.

The dynamics behind this conclusion and behind our forecasts are touched on in section 2 and discussed in more detail with reference to alternative scenarios in section 3.

To conduct this analysis we have used a system dynamics model. An overview of the model is provided in an Appendix to this report.

# 2. Forecasts

Our forecast for construction labour cost escalation in Canterbury is summarised in Table 1. Costs are expected to rise at rates averaging 2.5% higher than national wage inflation for the next four years. By 2018 wage inflation will reverse, returning local wage rates back nearer the national average.

### Table 1 Labour costs: actual and NZIER and Orion projections

Annual average of index and annual average % change

| | Index | | | Annual average % change | | |
|---|---|---|---|---|---|---|
| | Construction LCI - Canterbury | | All industries LCI - NZ | Construction LCI - Canterbury | | All industries LCI - NZ |
| **March years** | Orion forecast | NZIER forecast | NZIER forecast | Orion forecast | NZIER forecast | NZIER forecast |
| 2011 | 1028 | 1028 | 1023 | 2% | 2% | 2% |
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**Source: Statistics New Zealand, NZIER, Orion (Notes: (1) Implied by projections from Orion submission, page 581, section 9.26.5)**

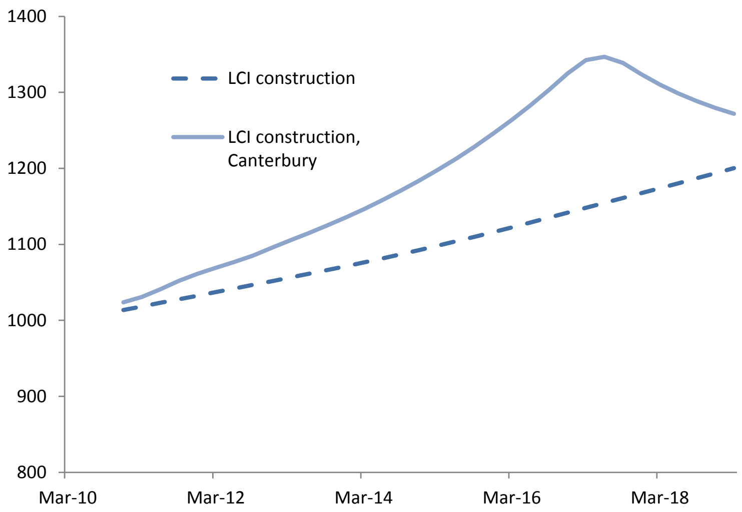
Our forecasts have Canterbury labour costs remaining above the national construction level out to March 2019 (see Figure 1).[1] This local wage growth premium is larger than anything seen in New Zealand before now (within the record of official statistics). Our earlier report showed that Auckland wage cost escalation has grown by, at most, 1.4% more than the national rate of cost escalation. We expect the cost escalation premium to briefly touch 4% in March year 2017.

This local wage premium is expected on the grounds that, for example, the Canterbury reconstruction process is an extreme situation in which demand for labour is likely to be less price-responsive compared with previous periods of localised cost escalation.

[1] This assumes that spill-over effects from inflationary pressure in Canterbury on labour costs in the rest of New Zealand will be relatively limited. Spill-overs are likely to be limited due to major inflationary effects such as housing costs being local in nature.

**Figure 1 Canterbury construction labour costs vs NZ**

Index




**Source: NZIER, Statistics New Zealand**

## 2.1. Costs in the context of the construction pipeline

Our forecasts indicate escalating cost pressures will last beyond the peak in the government's current projections of the rebuild pipeline. We forecast cost escalation to peak in March year 2017 while government-related construction work is expected to tail off after 2016.

There a number of reasons why our forecasts are not fully in-sync with the government's pipeline:

- our forecasts are based on estimates of potential private and public construction work, meaning we account for a larger work profile and consequently a bigger bottle neck
- our forecasts include lagged wage adjustment effects (discussed in 3.4 below) which see costs continue to rise even as the peak of construction has passed
- we have made (analytical) trade-offs between speed of rebuild and wage inflation which suggest that construction work will remain above historical 'normal' until approximately 2020 (discussed in 3.1 and 3.2 below).

## 2.2. Timing is everything

Our central projection balances the benefits of speedy construction with the costs of higher wages and the bust that would follow. Decisions that are being made over the timing of construction projects will doubtless be made with regard to other considerations in addition to these. This makes our central forecast uncertain.

What is less uncertain, however, is that a more rapid climb in labour costs than we are forecasting is likely to be associated with more rapid wage deflation at an earlier time than we are forecasting.

The faster wages grow, the faster workers are drawn into construction in Canterbury and the quicker work will be done. The sooner the work is done the sooner a construction sector bust will take place and with it a downward spiral in wages – which will have risen well above national levels in the meantime.

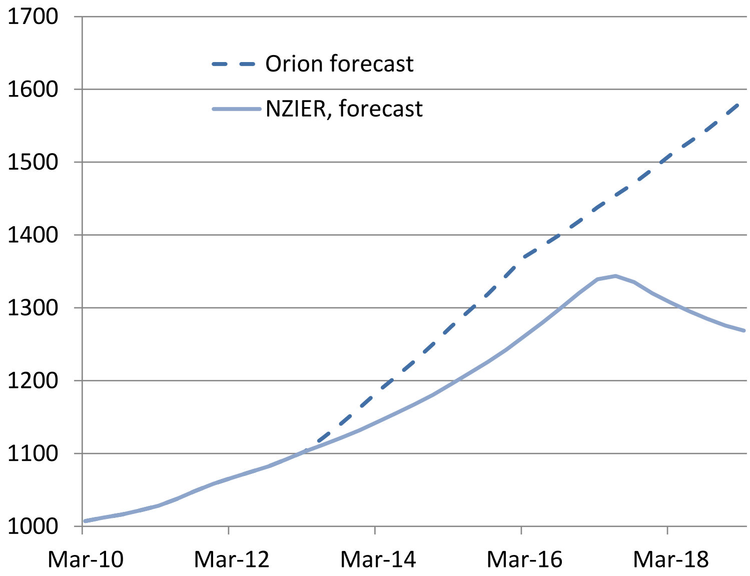
The lag between these events and their underlying causes can be quite protracted. In our projections the peak in 'unmet' labour demand occurs at the end of 2013, when the demand for labour is at its largest relative to available supply. The turning point in growth in labour supply (in response to higher wages) occurs at the end of 2016 when demand starts to ease. Cost escalation does not reverse until the end of 2017 due to natural lags in wage setting.

A decline in cost growth then takes place with growth turning negative by March year 2018 and overall wage and salary rates rapidly tending back towards NZ average cost inflation.

As discussed in our earlier report, these kinds of adjustment dynamics were missing from Orion's forecasts of cost escalation (see Figure 2)

**Figure 2 Comparison of NZIER and Orion forecasts**

Indices, annual averages




**Source: NZIER**

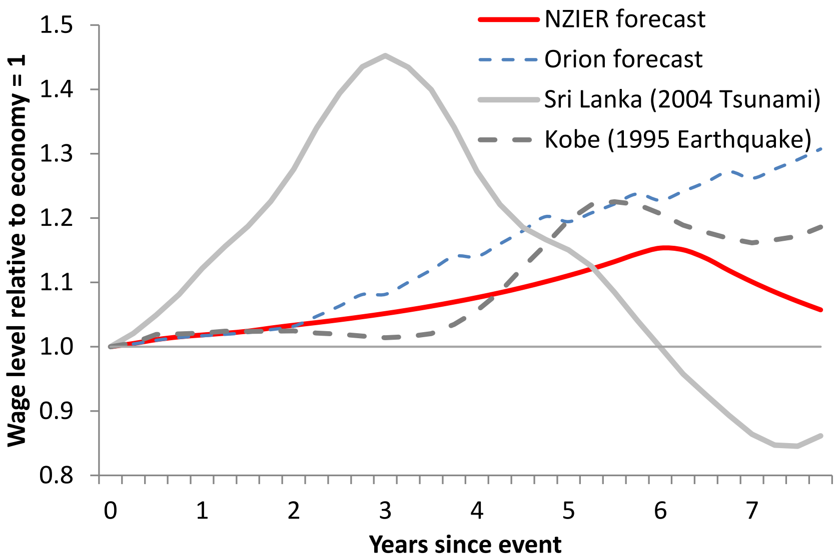
## 2.3. Comparison to international experience

International experience suggests that if labour costs needed to adjust to very high levels (such as those projected by Orion) then these adjustments would have materialised by now. Costs generally either rise very rapidly in the first 1-3 years following a disaster and then fall away rapidly or inflation persists for longer at lower rates. The fact that Canterbury labour cost escalation has thus far only grown by 1.5% above nationwide cost escalation suggests that the latter scenario is in play in New Zealand at the moment.

Our forecasts are for wage inflation dynamics in the construction sector similar to dynamics in Japan following the 1995 Kobe earthquake (see Figure 3). The forecasts include longer lived inflationary effects relative to alternative international benchmarks we considered in our earlier report.

## Figure 3 Forecast compared against events internationally

Wage levels relative to economy-wide benchmarks[2]




**Source: NZIER**

[2] Due to data limitations these benchmarks differ in each case with Sri Lankan construction sector inflation compared to economy-wide inflation, Japanese construction wage inflation compared to economy-wide wage inflation and our forecasts of Canterbury construction wage inflation compared to economy-wide construction labour cost inflation. This limits the comparability of these measures in terms of levels but the dynamics are informative for comparative purposes.

# 3. Drivers of cost escalation

The key drivers of cost escalation and its rate of increase are:

- the scale of demand relative to labour supply
- the willingness of buyers to pay higher costs or to defer projects until costs are lower
- the wage premium needed to draw labour into Canterbury.

These drivers are interrelated but the first two are the most important. If demand for labour is price insensitive and there is no opportunity to slow projects then costs will rise rapidly. This drives up localised costs (such as housing costs) which will increase the wage premium required to draw labour into Canterbury.

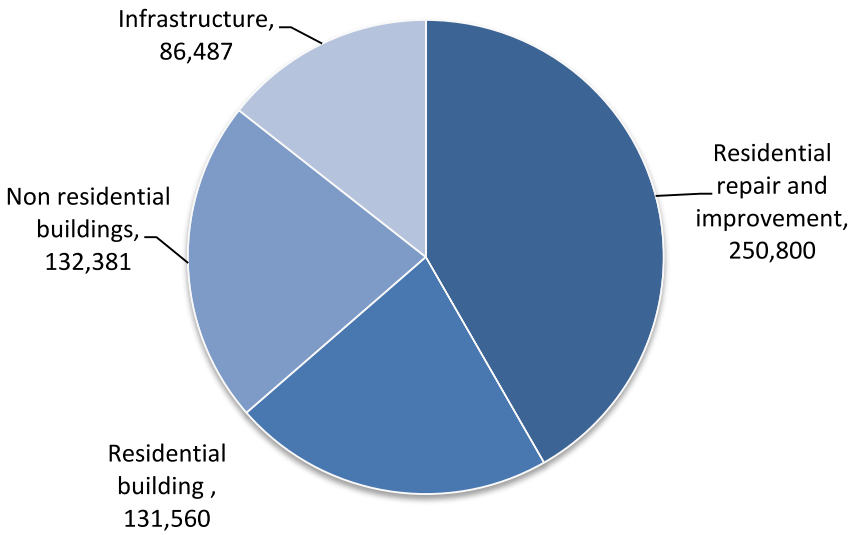
Time dynamics, such as search and wage negotiation also have important impacts on the timing and persistence of cost escalation.

## 3.1. Scale and timing of the construction task

Our estimate of the total scale of the task to be completed (post 2011 rather than from today) is 980,000 person months of labour.[3]

**Figure 4 Total rebuild task**

Model assumptions, measured in person months of work




**Source: NZIER**

[3] This is approximately 16 times our estimate of labour supplied in 2010 in earthquake affected areas of Canterbury.

The scale of this task has two dimensions. One is its absolute size. The other is the time over which the work 'needs' to be completed. By our estimation the total reconstruction-related construction task in Canterbury is equivalent to around 16 years of 'business as usual'.[4] A rebuild lasting 16 years would therefore result in no excess demand for labour and no cost escalation above the national average.[5]

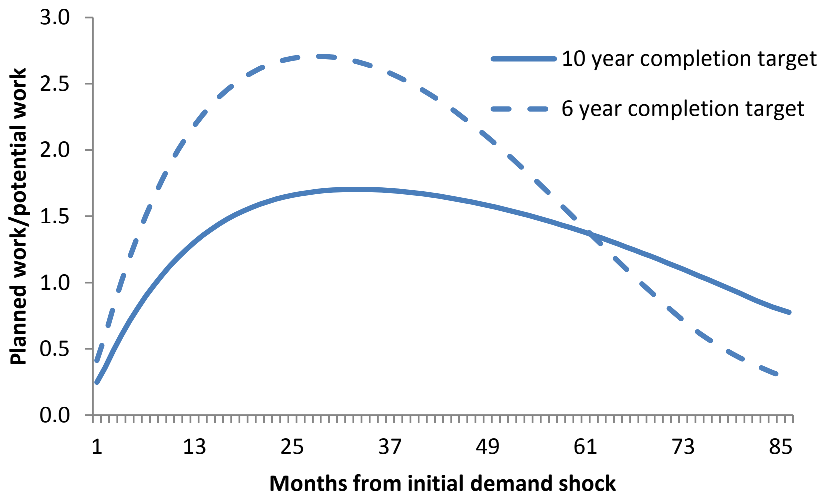
The magnitude of demand and timing of work can be contextualised by the gap between planned work and current or potential work which can be completed according to labour supply. This Canterbury construction output gap is the key driver of cost escalation (hereafter referred to simply as 'the output gap').

The impact of different project timeframes on the output gap is illustrated in Figure 5. This compares a 10 year completion timeframe (our central scenario) with the output gap under 6 year completion target. The output gap peaks 60% higher under the 6 year timeframe than under the 10 year timeframe.

Notice that the output gap declines more rapidly under the 6 year scenario than under the 10 year scenario. This is because higher wages must be paid to attract sufficient labour to complete the desired work on the desired timeframe. Assuming a shorter timeframe means assuming higher willingness to pay for the greater inflationary pressure which is created. This in turn means that when work is completed there is a much larger amount of 'excess labour' in the system – assuming that labour markets do not adjust extremely rapidly and that some workers are left out of work when the peak in construction activity has passed.

## Figure 5 Output gap under different timing scenarios

Ratio of planned work to potential work given labour supply




**Source: NZIER**

4 The rebuild task is estimated to require 984,000 person months of labour or approximately 16 times the business as usual requirement. Business as usual based on the value of work consented for residential buildings, alterations and non-building construction in March year 2010 plus the average non-residential building value consented between 2005 and 2010 – to remove 'lumpiness' from the estimate. This yields a business as usual value of $2.1 billion. Estimates of average labour requirements by project category imply 58,700 person months of labour under this business as usual value.

5 This is broadly true because most of the business of usual work that would otherwise have been completed has, for the most part, been displaced by reconstruction and repair work. Earthquake related repair or rebuild is generally a substitute for rather than an addition to business as usual demand.

## 3.2. Demand side response

The dynamics underlying the output gap illustrate that forecasting labour cost escalation requires taking a view on what buyers are willing to pay. This is a timing question: how quickly a buyer wants work to be completed and whether the buyer is willing to pay the premium to have work completed sooner rather than later.

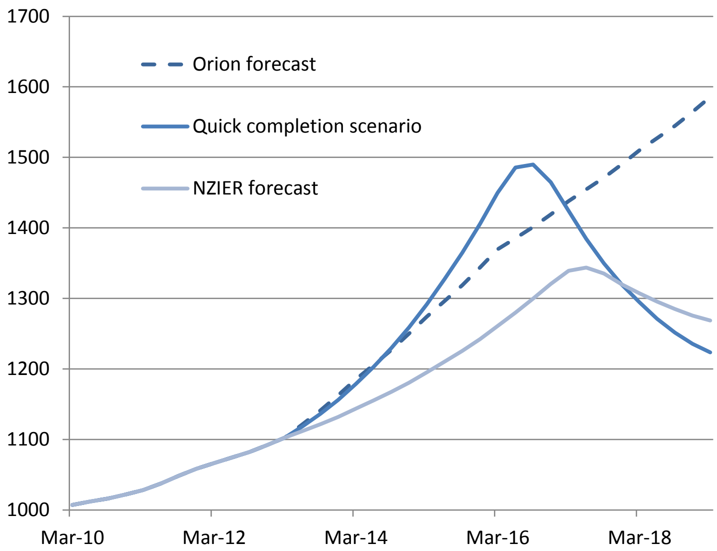
Questions of timing are important for gauging the likely speed and profile of cost inflation and deflation. A rapid rebuild will bring with it rapid cost escalation. A slower rebuild will see much more moderate growth rates.

We have assumed that buyers will not be willing to accept wage increases above 1% per month (12.7% per annum) and that full completion of reconstruction work will take 10 years.[6]

There are many alternative such assumptions which could be made. For example, we have considered what the implications would be of a 6 year rebuild time frame during which buyers are willing to pay wage increases in the order of 1.5% per month (19.6% per annum). This scenario sees wage inflation rise to 7% in March year 2014 and peak at 12% in March year 2016 (a cumulative 31% increase on March 2013 levels). As work is completed more quickly than in our central projection, wage deflation arrives more quickly and is more rapid due to greater excess labour supply (see Figure 6).

**Figure 6 Alternative demand response scenario**

Canterbury construction labour cost index




**Source: NZIER**

6 We settled on these round numbers as they are jointly compatible with feasible completion and avoidance of exponential cost increase. This 10 year timeframe is inferred by iteration of the model and examination of implied costs and feasibility of meeting the timeframe. It is jointly determined alongside the 1% 'willingness to pay' parameter. Large numbers of alternative combinations are possible. By comparison, a 6 year timeframe implies a doubling of cumulative wage costs compared to a 10 year target.

## 3.3. Labour supply response

The above analysis assumes that construction labour supply is reasonably responsive to changes in price. It assumes that a 50% increase in wages is required, at the margin, to double the labour supply.

Our choice of calibrating the model in this balances the willingness to pay of buyers with a reasonable supply response that enables work to be completed on a reasonable timeframe. This is largely a matter of judgement and we make use of comparison of cost escalation in similar circumstances elsewhere in the world – as discussed in our earlier report.

It is important to note that, other things equal, a lower supply response assumption means both higher cost escalation and longer time to project completion, other things being equal. Accordingly, supply response assumptions cannot be assessed in isolation from assumptions about willingness to pay and desired project completion timeframes.

We believe focussing on willingness to pay (time to completion targets and rates of wage increases for example) helps understanding of cost escalation pressures than focussing on labour supply response. The reason for this is that labour cost escalation in Canterbury is not a case of fundamental underlying supply or price shocks but a demand shock. Cost escalation thus reflects willingness of demand to pay higher prices rather than the fact that demand cannot escape higher prices.[7]

Note that our assumption of a 50% wage increase doubling labour supply (a wage elasticity of 4) is at the high end of conventional estimates but this is not a conventional labour supply 'elasticity'.[8] We are not considering the wage changes needed to induce workers into the labour force or to work more hours (although this is a component). Rather it is the wage increase necessary to entice workers or firms to the Canterbury region and to out-bid competing offers elsewhere. This includes compensation necessary to offset localised increases in the cost of living from pressure on the housing stock, for example.

We have used a single labour supply function in our analysis. This will understate the wage increases needed to obtain workers with specialist skills and overstate the wage increase required to attract people with generalist skills.

We expect that overestimation is a real issue because much of the construction work in Canterbury requires specialist rather than generalist skills. By our estimation, generalists (e.g. labourers) make up only 13% of the construction task (in person months). Given that the demand for these workers will be lower than for specialists and their supply is likely to be higher (relative to demand) we would expect cost escalation for these workers to be much lower than the average.

We have analysed the likely rate of cost escalation for generalists and find that it is likely to be similar to overall wage escalation in the near term but will peak sooner.

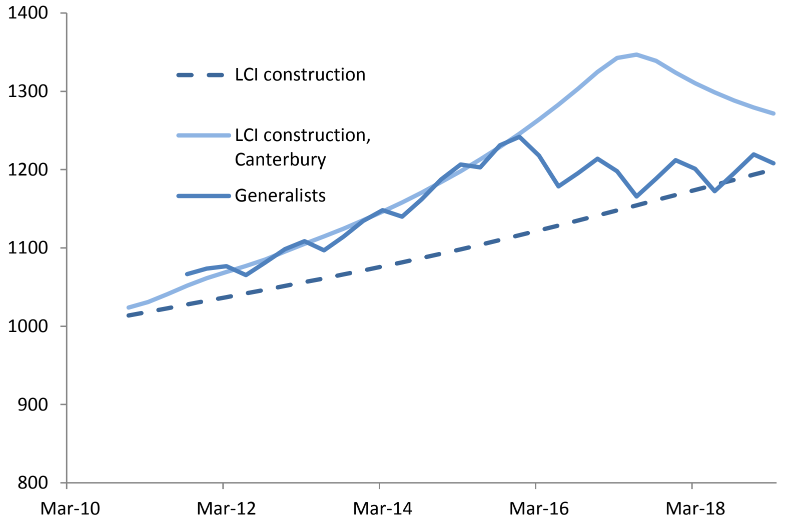
[7] The distinction between demand shocks and supply shocks is an important one and has important precedent in the case of commodity markets and oil prices in particular.

[8] As an aside, estimates of aggregate wage elasticities of supply usually range from around 0.5 to 1. We are not aware of any that rise above 2. This does not matter a great deal as ours are not conventional elasticities. Furthermore, most conventional elasticities deal with marginal changes in wages while our model is dealing with non-marginal changes. By comparison, our supply curve assumption has an implied elasticity 0f 0.86 for wage changes of 1%.

Prices do not rise as high because (proportionately) fewer workers are demanded and supply is more price-responsive. An illustrative example is provided in Figure 7.[9]

**Figure 7 Index of cost escalation for generalist labour**

Index




**Source: NZIER**

## 3.4. Lagged effects of cost escalation

In our forecasts inflationary pressure (as measured by the output gap) is highest over the next 12 to 24 months but inflation peaks much later in 2017. This lagged effect is because of:

- **search and matching and transaction costs**[10]
  - it takes time to search for new workers and to determine the level of wages required to attract sufficient labour to commence and complete planned projects
  - it takes time for new workers (e.g. from outside the region) to learn of higher wages on offer and to make themselves available for work in Canterbury
- **wage rigidity**
  - also referred to as wage stickiness this limits the speed of wage deflation even though demand for labour has declined and limits the speed of wage inflation even though demand has surged

[9] This analysis provides an important sensitivity to the central forecasts presented above. However, we do not recommend its direct use because it is a bespoke index without a pre-existing basis for comparison. This could be developed but would take some time.

[10] We would expect this process to be more rapid in the case of a coordinated rebuild effort than in normal market conditions where this process typically takes around 18 months.

- people do not renegotiate their wages at every point in time and even when labour demand begins to decline the majority of workers will remain at peak or pre-peak wages

- **gradual flow-on effects**[11] from wage inflation at the margin (that is, the additional wages needed to bring a certain number of workers in the region) to economy-wide inflation and effects on wage negotiations
  - not everybody demands or receives higher prevailing wages but, over time, wage negotiations see current workers (who may have been initially been happy to work at pre-earthquake wages) demand the higher wages being negotiated at the margin
  - more workers and higher wage workers increase costs of living in the area (e.g. rents) which flows through into higher wage demands
  - workers learn the extent of their bargaining power.

[11] These effects are partially a function of the above wage rigidity and search effects but are separately identified here as it is important to grasp the arithmetic behind these dynamics. Also, the general inflation and cost of living effects are distinct dynamics.

# Appendix A Model of labour cost dynamics

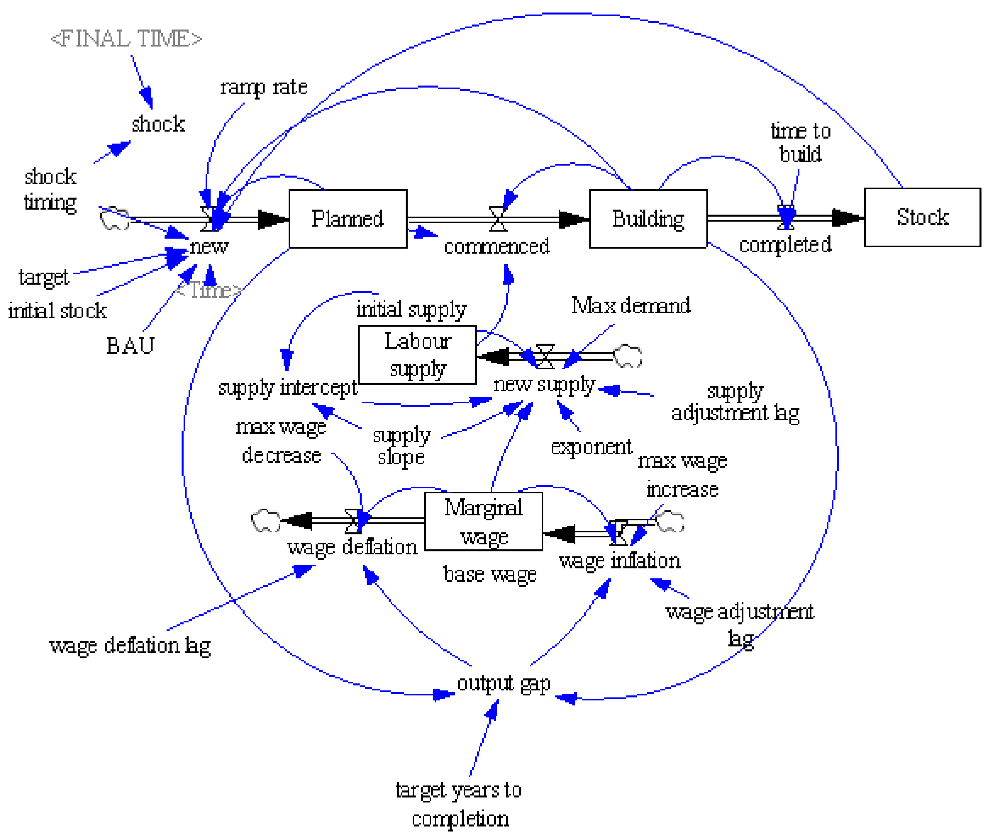
## Overview

To forecast labour cost escalation we have used a system dynamics model with input assumptions and parameters based on:

- a model of labour components of construction projects by skill mix and project type
- information on planned and projected construction activity from government and private sector sources
- findings from analysis in our earlier report on cost escalation dynamics.

Figure 8 provides an overview of the relationships in the model. All building activity volumes in the model are in person months of labour.

### Figure 8 System dynamics model schematic

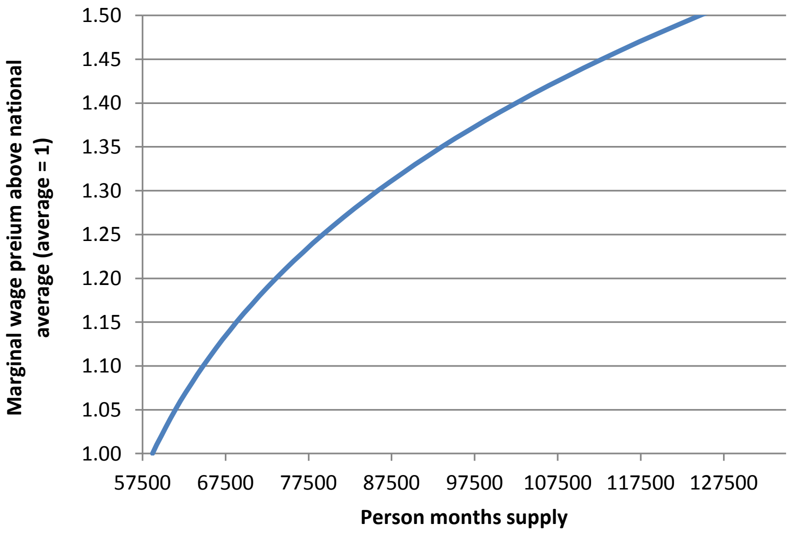



**Source: NZIER**

## Assumptions

The supply function is calibrated so that an approximate 50% increase of 'wages' at the margin is required to deliver a doubling of labour supply. The supply elasticity is, however, variable depending on the level of demand. Supply is much more elastic at higher prices.

### Figure 9 Model supply curve




**Source: NZIER**

In our central projection the supply curve (labour supply quantity (Q) in response to wage (W)) is:

$$Q = 48700 + 10000.Wage5$$

*Wage* has been normalised to 1 to reflect estimated 2010 labour supply. Thus *Wage* =1 sets Q to 2010 supply levels.

The *Max Demand* variable in the above schematic is not used. Rather demand is controlled via 'target years to completion' which affects the output gap from the perspective of labour demanders.

The *Max wage increase* parameter is 1% per month and *Max wage decrease* is assumed to be symmetric, i.e. 1% also. As the supply model is in levels, this assumption has a sizable impact. If price is allowed to move up and down very quickly supply and demand will rise and collapse very quickly. Labour costs, by extension, would rise very rapidly and collapse very rapidly.

One reason not to allow unfettered cost escalation, especially in the short term is that buyers are unlikely to be willing to accept inordinately high wage increases (whether by norm or by income constraint). We are guided by international experience in cost escalation to determine what is within the bounds of feasible cost increases.

The *wage adjustment lag* is short – one period/month – as demanders are assumed to move quickly to adjust prices to obtained desired labour.

The *supply adjustment lag* is 2 months, such that price changes will affect labour supply on the ground within 3 months. This is a short adjustment period. Usually wage-supply response times are 12 or more months, but this is a non-usual situation.

The build task is evaluated at an aggregate of $27.6 billion worth of work in approximate 2010/11 dollars. More recent higher estimates (e.g. $40 billion) are not used because we cannot determine the extent to which these estimates include cost escalation. Thus $27.6 billion is assumed to be a volume measure.

The construction task is measured using typical person months per $1 million dollars of work, based on bottom up model of project and skill needs.

Time to build is assumed to be an average of 7 months. This is a weighted average of project durations for each type of project. These range from an assumed average of 1 month for repair work to an average of 9 months for non-residential and infrastructure projects. There will of course be significant variation around these averages.