Profiling Long-Term Unemployment Utilising the Logit Model: A New Zealand Case Study

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ABSTRACT

This study attempts to fit the logit model to a random sample of data compiled by the New Zealand Employment Service on individuals who have completed unemployment spells, over the period 1988-1997. The objective is to estimate the probability that an individual job seeker, with a certain set of personal attributes, will become long-term unemployed. The regression results are consistent with *a priori* expectations. However, the predictive power of the model is low, lending support to conclusions from other empirical studies that have used other approaches to modelling long-term unemployment in New Zealand. That is, the current set of personal attributes on which data are collected in New Zealand are inadequate for modelling long-term unemployment.

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LIST OF ABBREVIATIONS

ACD	Average Completed Spell of Unemployment Duration
AID	Average Interrupted Spell of Unemployment Duration
ALMP	Active Labour Market Policies
CDF	Cumulative Distribution Function
DOL	New Zealand Department of Labour
EPF	Exit Probability Function
GDP	Gross Domestic Product
LFPR	Labour Force Participation Rates
LPM	Linear Probability Model
LRT	Likelihood Ratio Test
LTU	Long-term Unemployment
NCDS	National Child Development Study
NZES	New Zealand Employment Service
OECD	Organisation for Economic Cooperation and Development
OLS	Ordinary Least Squares
PODS	Percentage Change In Odds
STU	Short-term Unemployment
WINZ	Work and Income New Zealand

CHAPTER ONE

Introduction

Why are some workers unemployed? This fundamental question raises some of the thorniest issues in economics. ..., a competitive equilibrium equates the supply of workers with the demand for workers. The equilibrium wage clears the market, and all persons looking for work can find jobs. Despite this implication of equilibrium, unemployment is *a widespread phenomenon.*

(Borjas, 1996, p. 434)

1.0 Introduction

The importance of the issue of unemployment is concisely conveyed by Mankiw (2000 p.132) when he surmised that:

> Unemployment is the macroeconomic problem that affects people most directly and severely. For most people, the loss of a job means a reduced living standard and psychological distress. It is no surprise that unemployment is a frequent topic of political debate and that politicians often claim that their proposed policies would help create jobs.

Unemployment represents a waste of resources where job seekers are not contributing to the national income. A job is important to members of the labour force. The Prime Ministerial Task Force on Employment (1994, p.1) emphasised this importance of a job[1]:

> A paid job is important because it provides a means to earn a living. But a job also fulfils a variety of other social functions. A job is one way of participating in, and contributing to, the wider community. It is important to a person's sense of identity, independence, and self-worth.
>
> The benefits of a job reach beyond the jobholder – their family and others around them can gain financially, socially and emotionally. In the same

[1] The Prime Ministerial Task Force on Employment comprised eleven individuals representing a wide range of interests and perspectives on finding practical and sustainable solutions to New Zealand's unemployment problem (1994, Foreword).

> way, the effects of unemployment, particularly long-term or repeated spells of unemployment, impact on the individual, their family and community, and society. These effects may even be transmitted across generations. We cannot let these factors continue to erode our overall welfare as a nation.

1.1 New Zealand Economic Reforms

Before the 1987-1999 period for which unemployment spells are analysed in this study, the New Zealand economy had already undergone almost three years of "monetarism and economic liberalisation" under the 1984 Labour government (Brosnan et al., 1995, p. 686). According to Bollard (1987, pp. 38-39) the economic reforms implemented had taken four paths:

1. The removal of import licences and reduction of tariffs;[2]
2. The introduction of the 1986 Commerce Act enshrining a new competition policy in New Zealand; [3]
3. The removal of price controls instituted to protect certain industries in New Zealand; and
4. Reform of controls that affect the way goods and services are produced and distributed.

However, the New Zealand labour market did not go through this process of deregulation until the introduction of the Employment Contracts Act in 1991. The intention of the Employment Contracts Act 1991 was:

> ...to promote an efficient labour market. ...One major criticism of the system regulated by previous legislation was that it did not allow for an efficient labour market based on the operations of demand and supply. A system based on national awards and third-party intervention produced distortions and rigidities in the market which employers, in particular, were unable to overcome (Jeffry, 1997, p. 187).

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[2] For more information concerning the removal of import licences and tariff reduction see Wooding (1987)
[3] For more information concerning the 1986 Commerce Act see Vautier (1987).

The results of these state policies shifted power to the employers and changed the structure of the New Zealand labour market. Furthermore, during this period, the New Zealand unemployment rate increased from 4% in 1987 to 7.5% in 1999.[4]

1.2 Long-term Unemployment - Definition

The spell of unemployment is an important factor in the determination of what policy response is appropriate to rectify the unemployment problem. If unemployment is largely of short-term duration, it might be argued that the unemployment is frictional and therefore inevitable.[5] On the other hand, incessant or long-term unemployment signals a more enduring mismatch of job vacancies and job seekers in the labour market. A widely held view among economists is that if the natural rate of unemployment is to be reduced significantly, labour market policies must be aimed at the long-term unemployed.[6] During the early 1990's policy makers identified the growth of LTU as the single most worrying feature of New Zealand's recent economic and social performance (Prime Ministerial Task Force on Employment, 1994). This infers an accepted definition of what is meant by LTU and the successful identification of those characteristics possessed by unemployed individuals that are associated with, and indicative or predictive of, the incidence of LTU. On the definitional matter, there is no universally accepted definition of LTU. In New Zealand, LTU is defined as a period of continuous unemployment of 27 weeks or more (Statistics New Zealand, 2000), whereas the standard OECD definition utilises 52 weeks (OECD, 1987). In this study both definitions are employed in the analysis although more emphasis is placed on the New Zealand definition.

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[4] See Table 2.1, page 6 for unemployment rates for the total New Zealand labour force.
[5] Frictional unemployment will be explained in detail on p. 24 of this study.
[6] The natural rate of unemployment is "the rate of unemployment at which the rate of inflation is stable" (Wooding, 1997, p. 263).

1.3 The Problem Statement

Ethnic minority groups, job seekers over the age of 35 and those who hold no school qualifications are identified as disadvantaged groups in New Zealand in terms of LTU.[7] However, this only identifies each group of disadvantaged job seekers and job seekers have different attributes within each group. For example, a 16 year-old male Maori from Wellington with no school qualifications would not have the same odds of experiencing LTU as a 35 year-old male Maori from Northland with a university degree. Hence, I intend to formulate a means of profiling individual job seekers based on his/her personal attributes to identify the odds he/she will experience LTU.

1.4 Plan of Thesis

To see the extent of the unemployment problem in New Zealand, Chapter 2 introduces disaggregated New Zealand unemployment statistics for the period 1987-1999. Chapter 3 introduces the theories concerning different approaches to explaining the presence of unemployment in the labour market and the types of unemployment based on classifications by economists due to different attributes. Then there is a brief discussion concerning factors apart from demographic factors that affect the unemployment duration. Finally, the focus shifts to the LTU problem and profiling of an individual's long-term unemployment risk in other countries and in New Zealand. Chapter 4 provides information on the data collection and characteristics of the data as well as the methodology. This discusses the decision to use the logit model based on the binary nature of the data. In Chapter 5 the results of the model are analysed and interpreted, both on a yearly basis and for the whole period. Finally, in Chapter 6 there will be conclusions of this exercise and possible recommendations based upon these findings are discussed.

[7] See Chapter 2, Section 2.2 for details concerning LTU in New Zealand.

CHAPTER TWO

Disaggregated New Zealand Statistics

2.0 Introduction

Many studies have shown that unemployment does not hit equally the different groups within the population or the various regions within the country. The following analysis uses statistics taken from the Household Labour Force Survey (Statistics New Zealand, 2000). In Section 2.1 we focus on labour force participation rates (LFPR) and unemployment rates for certain categories of the population. It provides an overview of development in the labour force during the period of analysis, 1987-1999 (see Appendix A). In Section 2.2 the discussion focuses on the definition of LTU, both in New Zealand and the Organisation for Economic Cooperation and Development (OECD), as well as an analysis of New Zealand LTU statistics. Finally, Section 2.3 summarises the discussion concerning the unemployment problem in New Zealand.

2.1 Labour Force Participation and Unemployment Rates

2.1.1 Gender (Table 2.1)

Traditionally, male LFPR has been higher in the labour market than female LFPR. However, as time progressed, male LFPR has steadily decreased (from 78.6% in 1987 to 73.5% in 1999), while female LFPR has steadily increased (from 54.3% in 1987 to 57.3% in 1999). This growth in female LFPR can be attributed to several factors. There was stronger growth in females entering the labour force rather than leaving it to a state of non-participation (25% and 11% increases respectively for the 1987-1999 period). Also, many industries were now hiring part-time employees rather than full-time employees. With the conversion from full-time to part-time employment, certain industries began to experience growth, which tended to favour women. Employment growth in the finance and services industries countered the adverse effect of large job losses in the agriculture and manufacturing industries, contributing to increased female labour force participation

(Brosnan et al., 1995, p. 690). However, with the increased LFPR, female unemployment levels also increased (from 4.6% in 1987 to 7.2% in 1999).

Males, however, had a relatively larger growth in non-participation rather than labour force participation (45% and 9% increases respectively for the 1987-1999 period). The decline in employment in the manufacturing, construction and agricultural sectors where males had a strong labour force participation contributed to the decline in male LFPR and also the increase in unemployment levels (from 3.6% in 1987 to 7.7% in 1999). A contributing factor to the job losses in these industries was the removal of tariff protection and subsidies (Bollard, 1987, pp. 38-39).

TABLE 2.1: LABOUR FORCE PARTICIPATION RATES AND UNEMPLOYMENT RATES BY GENDER

Average for Year ended March	Male		Female		Total	
	LFPR (%)	UR (%)	LFPR (%)	UR (%)	LFPR (%)	UR (%)
1987	78.6	3.6	54.3	4.6	66.2	4.0
1988	77.6	4.2	54.6	4.4	65.8	4.3
1989	75.6	6.3	53.4	6.0	64.2	6.2
1990	74.4	7.3	53.0	6.9	63.4	7.1
1991	74.1	8.8	54.2	7.9	63.9	8.4
1992	73.7	11.2	54.1	9.7	63.6	10.6
1993	73.0	10.7	53.9	9.3	63.2	10.1
1994	73.4	9.7	54.3	8.8	63.6	9.3
1995	73.9	7.8	55.2	7.1	64.3	7.5
1996	74.4	6.1	56.4	6.2	65.1	6.2
1997	74.6	6.1	57.6	6.3	65.8	6.2
1998	74.4	6.9	57.2	6.8	65.6	6.8
1999	73.5	7.7	57.3	7.2	65.2	7.5

Source: Household Labour Force Survey (Statistics New Zealand, 2000, Labour Market Statistics 1999, Table 3.1, p. 34)

2.1.2 Age Group (Appendix A, Tables A.1A and A.1B)

Job seekers aged 15-19 are the most disadvantaged group with the second lowest LFPR and the highest unemployment rate (52.8% and 17.5% respectively in 1999). The LFPR should not be too disconcerting as many people in this age group are continuing their education. However, this group and the 20-24 age group tend to have higher rates of unemployment than other groups. The spells are usually of short duration and tend to be

recurrent. This is expected, as job seekers of these age groups tend to be either in part-time, temporary jobs or searching for the right job. Job seekers at the prime working age (25-54) have LFPR that are higher and unemployment rates that are lower than the younger work force. These statistics indicate that prime aged workers have relative job stability compared to younger workers. Older workers 55 and above have relatively low LFPR and unemployment rates but this would suggest that once workers become unemployed at this age the job seeker would consider leaving the labour force or would be experiencing long spells of unemployment. The latter would occur due to job seekers lacking the skills utilised in the labour market and requiring time to retrain if motivated.

*2.1.3 **Ethnicity** (Appendix A, Table A.2)*

Apart from New Zealand European/Pakeha, all other ethnic groups have seen decreases in their LFPR. Over the 1987-1999 period there were large decreases in LFPR by Pacific Islands and Other ethnic groups (8.4 percentage points and 13.2 percentage points respectively). These have coincided with large increases of unemployment rates (from 10.8% in 1987 to 18.6% in 1999 for Maori; from 6.1% in 1987 to 14.8% in 1999 for Pacific Islands and; from 3.1% in 1987 to 13.3% in 1999 for Other). These rates indicated economic reforms, economic downturn and industrial restructuring have adversely affected the minority groups resulting in increased redundancy (Brosnan et al., 1995, p. 689). Only NZ European/Pakeha had improved LFPR while the unemployment rate did not rise as dramatically as for the other ethnic groups (from 3.2% in 1987 to 5.5% in 1999).

*2.1.4 **Education** (Appendix A, Table A.3)*

The rates – both LFPR and unemployment rates - follow basic human capital theory in that those who invest in education improve their chances of employment, thus reducing their chances of unemployment.[1] The unemployed with no qualifications had the lowest participation rates, but the highest unemployment rates of all the groups (48.7% and 12.6% respectively in 1999). At the other extreme, where a job seeker has both school

[1] This is a very simple explanation of human capital theory. See Borjas (1996, pp. 220-247) for an enhanced explanation of this theory emphasising education.

and post-school qualifications, the LFPR is the highest and the unemployment rate is the lowest in all groups (79.2% and 4.9% respectively in 1999). The other groups have LFPR and unemployment rates that indicate any form of educational qualification is better than none if job seekers want to improve their chances of employment.

2.1.5 ***Regional*** *(Appendix A, Table A.4A and A.4B)*

High unemployment rates have tended to be associated with regions with slow economic growth, low growth in employment opportunities, or in rural areas, or some combination of these three elements. This is illustrated by the Bay of Plenty, where LFPR are relatively high, yet the region had the second highest unemployment rate (11.4% in 1999) due to a large proportion of work being of a seasonal nature. However, Tasman/Nelson-Marlborough/West Coast also has relatively high LFPR (68.8% in 1999) but the lowest unemployment rate in New /Zealand (6.1% along with Wellington in 1999). Although both regions have strong seasonal work, the Tasman area has a diverse range of agricultural industries that keeps employment up and industry growth in the region is higher than in the Bay of Plenty. Over the 1987-1999 period the employment situation in Northland has not improved. The unemployment rate has been consistently higher than any other regions and reflects the lack of job opportunities available for Northland people. Of the urban regions, Canterbury has fared the worst with 7.7% unemployment in 1999. This could be in part attributed to a large rural component compared to the other regions. The statistics support evidence that job seekers living in rural areas are relatively more disadvantaged than job seekers in urban areas as far as employment opportunities are concerned.

2.2 *Long-term Unemployment*

In Chapter 1, LTU was identified as a problem in the New Zealand economy. The following preliminary analysis of LTU is based on statistics from the Household Labour Force Survey (Statistics New Zealand, 2000). The results of this analysis should indicate which demographic groups are mostly affected by LTU.

2.2.1 *Age Group (Tables 2.2A and 2.2B)*

Results for LTU by age group as a percentage of total unemployment in Table 2.2A indicate that younger unemployed tend to have a relatively lower proportion of long-term unemployed than older unemployed. Both the 15-19 and 20-24 age groups have the lowest proportion of LTU, less than 30% (23.1% and 29.4% respectively in 1999). From age 35 and above, the proportion of long-term unemployed is above 42% in 1999. This signifies that when the unemployed is older, it is harder for him/her to gain reemployment. Results for long-term unemployment by age group as a percentage of total long-term unemployment are presented in Table 2.2B. In 1987, the 15-19 age group had the largest proportion of LTU (30.3%). The lowest proportion

TABLE 2.2A: LONG-TERM UNEMPLOYMENT BY AGE GROUP AS A PERCENTAGE OF TOTAL UNEMPLOYMENT[1]

Average for Year ended March	15-19	20-24	25-34	35-44	45-54	55+
1987	17.4	14.7	18.2	21.4	30.0	..
1988	19.6	21.2	20.6	25.3	30.4	55.0
1989	21.0	31.2	31.0	30.2	32.6	59.4
1990	24.2	30.6	33.1	35.1	45.5	57.5
1991	26.2	32.2	37.3	41.2	45.1	50.8
1992	34.8	42.0	44.3	46.9	52.8	68.3
1993	37.4	46.9	50.4	54.7	60.0	68.3
1994	34.1	45.0	49.0	52.7	60.8	67.6
1995	28.2	39.0	43.3	48.8	58.8	68.9
1996	23.7	27.4	35.7	43.5	50.4	64.7
1997	20.2	30.2	31.4	37.3	48.3	50.8
1998	20.2	27.8	32.0	40.5	46.6	49.3
1999	23.1	29.4	31.0	42.4	45.9	52.2

(1) Long-term unemployment is defined as duration of unemployment of 27 weeks or longer.

Source: Household Labour Force Survey (Statistics New Zealand, 2000, Table 5.7, p. 91).

TABLE 2.2B: LONG-TERM UNEMPLOYMENT BY AGE GROUP AS A PERCENTAGE OF TOTAL LONG-TERM UNEMPLOYMENT[1]

Average for Year ended March	15-19	20-24	25-34	35-44	45-54	55+
1987	30.3	13.1	23.8	14.8	12.3	..
1988	25.8	20.0	22.6	14.8	11.0	7.1
1989	18.3	22.2	26.1	16.9	9.9	6.7
1990	17.2	19.3	26.2	16.1	15.0	6.3
1991	16.3	17.8	27.3	19.4	13.2	6.2
1992	15.4	20.8	26.9	18.1	13.4	5.4
1993	13.7	19.1	27.0	19.6	14.0	6.7
1994	13.0	18.2	25.7	20.2	16.3	6.6
1995	12.1	17.0	24.4	21.4	17.6	7.4
1996	14.2	13.4	21.6	24.9	17.7	8.2
1997	12.6	15.2	22.8	21.3	19.2	8.7
1998	11.9	16.2	22.6	23.8	17.8	8.1
1999	11.9	14.7	20.4	24.9	18.2	9.8

(1) See Table 2.2A.

of LTU in 1987 was 12.3% for the 45-54 age group. However, by the end of the period, the 15-19 age group had the second lowest proportion of long-term unemployed (11.9% in 1999). Unemployed in the 45-54 age group contributed 18.2% of long-term unemployed in 1999. The 35-44 age group contributed the largest proportion of long-term unemployed (24.9% in 1999). This emphasises the point that young members of the labour force experience many short spells of unemployment.

2.2.2 Ethnicity (Tables 2.3A and 2.3B)

The results for LTU by ethnic group as a percentage of total unemployed (Table 2.3A) reveal all ethnic groups have experienced an increase in LTU. A high proportion of Maori, Other and Pacific Island ethnic groups are long-term unemployed (approximately 40% for each group in 1999) while European/Pakeha also have problems where in 1999 approximately one-third of unemployed were long-term unemployed. LTU by ethnic group as a percentage of total LTU is presented in Table 2.3B. The proportion of European/Pakeha has decreased from 62.3% in 1987 to 54.6% in 1999. This still remains a large proportion of long-term unemployed. Maori has decreased their proportion of long-term unemployed (from 29.5% in 1987 to 25.6% in 1999) while Pacific Islands

made a steady increase (from 8.1% in 1987 to 9.2% in 1999). The 'Other' ethnic group has been adversely affected during this period even greater than the Pacific Island group, increasing in proportion (from 3.9% in 1987 to 10.8% in 1999).

TABLE 2.3A: LONG-TERM UNEMPLOYMENT BY ETHNIC GROUP AS A PERCENTAGE OF TOTAL UNEMPLOYMENT[1]

Average for year ended March	NZ European/ Pakeha	Maori	Pacific Island	Other
1987	17.6	23.4	..	..
1988	20.8	26.8	..	..
1989	27.6	32.7	32.4	28.2
1990	31.9	31.7	41.3	31.1
1991	31.8	43.7	46.2	34.3
1992	39.4	51.9	57.4	41.2
1993	46.6	53.5	68.6	45.1
1994	45.3	52.8	58.6	52.2
1995	40.1	48.3	56.7	41.5
1996	33.7	37.0	50.5	39.7
1997	30.7	36.8	43.3	33.3
1998	29.7	36.7	39.8	40.0
1999	32.0	40.2	39.1	40.2

(1) Long-term unemployment is defined as duration of unemployment of 27 weeks or longer.
Source: Household Labour Force Survey (Statistics New Zealand, 2000, Table 5.8, p. 92).

TABLE 2.3B: LONG-TERM UNEMPLOYMENT BY ETHNIC GROUP AS A PERCENTAGE OF TOTAL LONG-TERM UNEMPLOYMENT[1]

Average for year ended March	NZ European/ Pakeha	Maori	Pacific Island	Other
1987	62.3	29.5	..	..
1988	63.2	25.8	..	..
1989	64.4	22.9	8.1	3.9
1990	65.4	19.9	10.4	3.8
1991	58.4	25.6	11.1	4.7
1992	57.7	24.9	12.8	4.6
1993	61.3	22.0	12.8	3.8
1994	59.8	23.2	12.5	4.6
1995	56.9	25.0	13.4	4.7
1996	57.7	22.6	11.7	7.7
1997	56.4	24.1	11.8	7.6
1998	51.8	25.7	11.2	11.4
1999	54.6	25.6	9.2	10.8

(1) See Table 2.3A.

2.2.3 Education (Tables 2.4A and 2.4B)

LTU by educational attainment as a percentage of total unemployed (Table 2.4A) saw relatively large increases in proportions of long-term unemployed for all categories. The LTU of job seekers with no qualifications were of special concern, increasing by 20 percentage points (from 22.7% of unemployed with no qualifications in 1987 to 42.7% in 1999). Long-term unemployed job seekers with only post-school qualifications increased from 22% in 1987 to 41.1% in 1999. This indicates the tough screening in the market with employers preferring job seekers with either school qualifications or a combination of school /post school qualifications rather than job seekers with no qualifications or only post school qualifications. The latter may reflect job seekers with skills from apprenticeships, trade or training programmes but no formal school or tertiary qualifications. However, even though job seekers with formal qualifications (school qualifications and/or post school qualifications) have lower chances of unemployment, approximately 20% of unemployed with this attribute become long-term unemployed.

TABLE 2.4A: LONG-TERM UNEMPLOYMENT BY EDUCATIONAL ATTAINMENT AS A PERCENTAGE OF TOTAL UNEMPLOYMENT(1)

Average for Year ended March	No Qualifications	School Qualifications	Post School Qualifications Only	Post School and School Qualifications
1987	22.7	13.6	22.0	13.6
1988	28.0	16.1	24.1	16.3
1989	33.4	24.1	31.5	23.2
1990	39.5	26.7	36.5	18.5
1991	45.1	26.8	41.9	25.7
1992	54.1	34.5	47.3	35.1
1993	58.4	41.9	58.3	40.9
1994	56.7	39.1	58.0	39.9
1995	52.9	33.9	52.7	35.3
1996	44.5	28.4	42.6	28.9
1997	41.9	23.0	36.6	29.3
1998	43.4	23.8	35.8	26.8
1999	42.7	29.4	41.1	28.3

(1) Long-term unemployment is defined as duration of unemployment of 27 weeks or longer.

Source: Household Labour Force Survey (Statistics New Zealand, 2000, Table 5.9, p. 93).

LTU by educational attainment as a percentage of total LTU indicate that all groups have been adversely affected by LTU. But long-term job seekers with no qualifications are in a relatively worse situation than the other groups making up 44% (1999) of long-term unemployed in New Zealand (Table 2.4B).

TABLE 2.4B: LONG-TERM UNEMPLOYMENT BY EDUCATIONAL ATTAINMENT AS A PERCENTAGE OF TOTAL LONG-TERM UNEMPLOYMENT[1]

Average for Year ended March	No Qualifications	School Qualifications	Post School Qualifications Only	Post School and School Qualifications
1987	64.8	15.6	9.0	9.8
1988	63.9	17.4	9.0	11.0
1989	59.5	19.7	9.9	11.3
1990	59.4	19.3	11.4	9.0
1991	52.9	19.8	11.8	15.1
1992	50.3	20.0	11.3	17.5
1993	47.9	20.4	11.8	19.2
1994	48.2	20.2	13.3	18.1
1995	48.5	19.5	13.5	17.9
1996	48.8	18.9	12.2	19.9
1997	48.6	17.8	11.8	21.5
1998	48.9	18.1	11.4	21.6
1999	44.0	20.7	12.7	22.7

(1) See Table 2.4A.

2.3 Concluding Comments

In Section 2.1 unemployment in New Zealand was found to be a problem for job seekers with the following attributes: Male; aged 15-19; non-European / Pakeha; no qualifications; registered in Northland. When the analysis includes LTU statistics (Section 2.2), there is little difference. Job seekers who are non-European / Pakeha and have no qualifications are mostly affected by LTU. However, the LTU problem affects job seekers over the age of 35 relatively more than job seekers from the 15-19 age group. This indicates that one policy to reduce unemployment cannot be used, as the causes for unemployment are different and affect job seeker groups differently.

Thus, in Chapter 3, the discussion focuses on theories developed to first explain the presence of unemployment in the labour market. Second, there is an explanation of the different types of unemployment and how the unemployment duration can be influenced. Finally, the discussion focuses on the LTU problem and empirical research concerning LTU profiling.

CHAPTER THREE

Literature Review: Unemployment Duration and Long-term Unemployment Profiling

The dimensions of the LTU problem cannot be seen simply in terms of the basic measure used, the overall numbers who could be categorised as being unemployed for 12 months or more. The problem must also be examined in terms of the components of the LTU total as measured by such factors as age, gender, skill, ethnic group and location to basically see who are the sub-groups of the labour force most affected.

(Walsh, 1987, p. 10)

3.0 Introduction

This chapter begins by introducing the theories that have been used to explain the presence of unemployment in the labour market (Section 3.1). Also, there are three main types of unemployment identified by economists. These are discussed, especially focussing on LTU closely tied to structural unemployment (Section 3.2). In the previous chapter, demographic characteristics of individual job seekers were identified as a means of affecting unemployment duration. However, other factors affect the duration of unemployment and these factors are discussed in Section 3.3. Also in the previous chapter, the profiling of the potentially long-term unemployed was identified as critical if a job seeker is to be prevented from the further disadvantage of LTU. In Section 3.4, we initially discuss the use of long-term unemployment profiling by other countries and also the importance of introducing assistance early in the unemployment spell. Models using survival analysis (Gardiner, 1995; Payne et al., 1996; Watson et al., 1997; Van den Berg and Ridder, 1998) are investigated as they use demographic characteristics as a means of identifying recent unemployed at high risk of LTU. Thus conclusions of what these models have or have not achieved will be eventually used in developing a model for this study to be discussed in the next chapter.

3.1 The Labour Market[1]

3.1.1 Classical Labour Market

The main theoretical belief of the classical economists was that the market would always maintain equilibrium and that this was achieved by some 'self-correcting mechanism'. Wooding (1997, p. 19) describes classical economists as applying "standard supply and demand tools of microeconomics to macroeconomic questions". By assuming that there was perfect competition in the labour market, it implied "that neither excess demand nor excess supply could exist because prices and wages would adjust to clear markets in goods and labour" (ibid, p. 19).

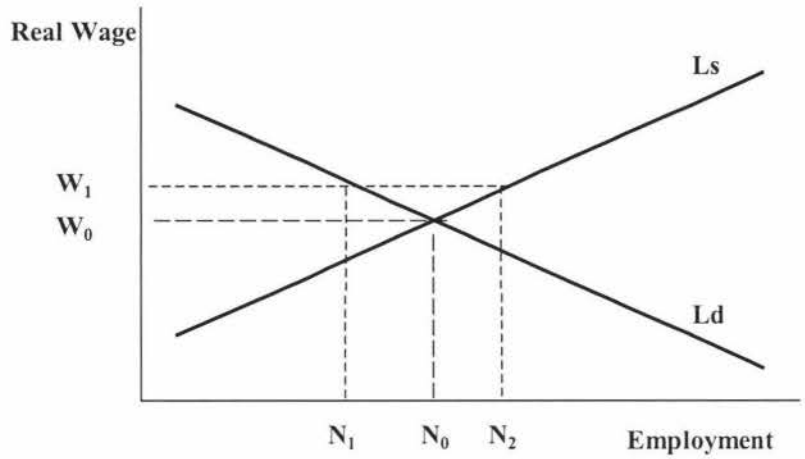
McConnell and Brue (1995, pp. 155-156) listed the following characteristics to describe a perfectly competitive labour market:

1. A large number of firms competing with one another to hire a specific type of labor to fill identical jobs;
2. numerous qualified people who have identical skills and who independently supply their labor services;[2]
3. "wage-taking" behavior – that is, neither workers nor firms exert control over the market wage; and
4. perfect, costless information and labor mobility.

If any unemployment were to arise this would be quickly corrected by the market. The reason though for unemployment existing was attributed to high real wages. This is shown in Figure 3.1 where the real wage rate W_1 is higher than the equilibrium wage level W_0. At this higher wage level, unemployment is the difference between $N_2 - N_1$. Since the classical market is perfectly competitive, if real wages were high, they were

[1] This description of the labour model using Classical, Keynesian and Neo-classical models is found in Smith (1994) and Wooding (1997). They are also discussed in Layard, Nickell and Jackman (1994), McConnell and Brue (1995), Borjas (1996) and Romer (1996).
[2] This is also called homogeneous workers.

Figure 3.1 Classical Labour Market Model



Source: Adapted from McConnell & Brue, 1995, Figure 19.3, p. 538

forced downwards as the unemployed were willing to work for lower wages, moving the labour market back to equilibrium. Hence, Figure 3.1 reveals that the labour market would always clear at the equilibrium, where labour demand equals labour supply and N_0 are employed.

3.1.2 Keynesian Labour Market

Under the Keynesian labour market the emphasis was placed on rigid nominal wages. Using the unemployment situation in Figure 3.1, to reduce unemployment, the nominal wage would need to be reduced, thus reducing the real wage. However, unemployment was found to be persistent during the time of the Great Depression of the 1930s. Keynes attributed this persistent unemployment to:

> "a lack of demand for labour, denied that wage reductions in a free market would eliminate unemployment, and treated aggregate employment as a direct function of total output, so that policies which reduced output would reduce employment at the same time" (Bertram, 1993, p. 33).

Keynes', a strong advocate for government intervention in the economy, especially during the 'Great Depression', believed there was also a place for this interventionism in the labour market. Keynes' believed that if the private sector was not purchasing a sufficient amount of goods for the economy to have full employment, then the government should introduce expansionary fiscal or monetary policies to raise the aggregate demand for goods in the economy. This "raises output and increases prices by a greater proportion than money wages rise, thereby reducing the real wage and ... increasing employment" (Smith, 1994, p. 204). Hence, using Figure 3.1, the real wage will fall back to the equilibrium wage level, W_0. The only problem with this particular policy by Keynes is that by forcing up prices greater than monetary wages, the economy will begin to experience inflationary pressures.

3.1.3 Neo-classical Labour Market and Job Search Theory[3]

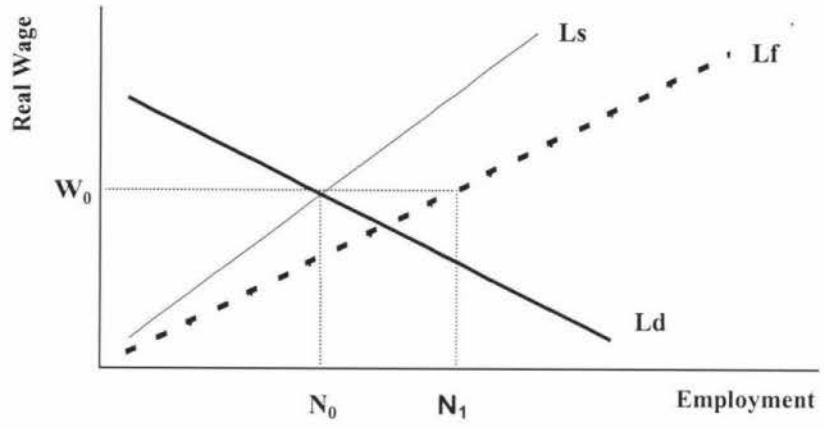
In the mid-1970s inflation began to rise sharply along with a rise in unemployment, raising questions concerning Keynesian reasoning for remedies to unemployment. This stagflation led to new explanations of unemployment and remedies for them. This new approach was called 'monetarism' or 'neo-classical' economics. Wooding (1997, p.20) noted that:

> "In the long run, ... the level of real GDP is limited by potential output. Friedman had long maintained that any employment increases resulting from an activist policy could be only temporary at best. In the long run, he said there is a natural rate of unemployment, which may be a good deal higher than that implied in the conventional definition of full employment. Attempts to reduce unemployment below its natural rate, by increasing government spending or reducing government taxation, will eventually generate inflation without guaranteeing full employment"[4].

This is seen in Figure 3.2, which displays the Neoclassical labour model.

[3] The term refers to both neo-classical and monetarist economists.
[4] Refers to Keynesian interventionist policies.

Figure 3.2 Neo-classical Labour Market Model



Source: Adapted from Smith, 1994, Figure 9.13, p. 210

The Neoclassical economists:

> "...focused on the supply side of the labour market – the willingness of workers to work at a market clearing wage – and explained unemployment as a condition entered into voluntarily by workers holding out for wages above what the market would bear. Unemployment was therefore to be fought by exposing individual workers to more competitive pressures, and by freeing up labour market institutions to enable workers to search for jobs, and assess market conditions, more rapidly" (Bertram, 1993, p. 33).

In the neoclassical model there are two labour supply curves. The **Ls** labour supply curve represents the 'effective labour supply'. This is the amount of workers that are being supplied at a particular time. However, **Lf** represents the 'notional labour supply' – this represents the amount of labour that should be supplied for the operation of the economy at that time (Smith, 1994, p. 210). Hence, the natural rate of unemployment would be the horizontal distance between the labour supply and labour force curves, when the equilibrium wage rate (W_0) is reached and the labour market clears ($\mathbf{N_1} - \mathbf{N_0}$). The natural rate of unemployment can be described as having three characteristics (Ehrenberg and Smith, 1994, p. 582):

1. The rate of unemployment which is consistent with price level stability or with a constant rate of inflation;
2. The rate of voluntary or frictional unemployment consistent with long-run equilibrium in the labour market; and
3. The natural rate of unemployment can vary in value, it is not one steady level.

The third point is reflected in Figure 3.2 where the different elasicities mean if the wage levels move in the long run the unemployment gap would either increase or decrease in an equilibrium situation.

With the development of neo-classical models explaining unemployment as being voluntary, job search was developed to explain the phenomenon as displayed by Figure 3.2.

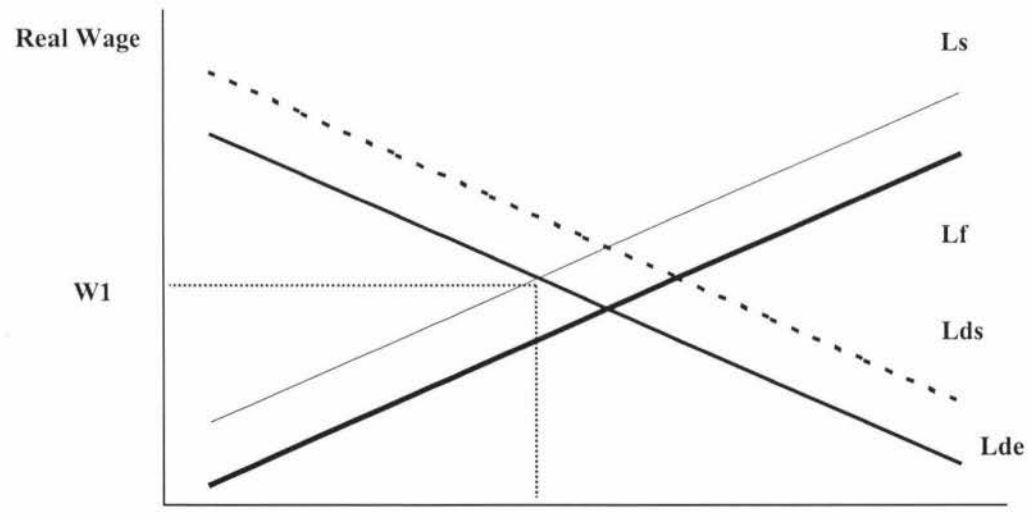
Stigler's (1962) study discussed the importance of information and its effects on participants in the labour market. Under models of perfect competition, information is perfect, and therefore no costs are incurred, as there is no need for more information.[5] Firms would know which potential workers have relatively higher productivity compared to others, and workers would know which firms are paying higher wages and provide good work conditions.

The basic principle of search theory is that in the labour market there is the presence of imperfect information. The knowledge of both worker and firms is limited. Hence, to obtain additional information, both parties must pay to acquire the information needed so a firm could hire a job seeker, and a job seeker can find a job. Although workers are assumed to be homogeneous, wages would be normally dispersed due to the assumption of imperfect information. According to Stigler (ibid., p. 104) the function of information would be "to prevent less efficient employers from obtaining labor, and inefficient workers from obtaining better jobs". Stigler perceived the optimal amount of job search by a job seeker to be decided through marginal analysis. According to Kaufman (1994, p. 660), a job seeker would:

"... keep on contacting additional firms as long as the marginal benefit of further search exceeds the marginal increase in costs; when the two are equal, the optimal number of job contacts has been reached".

Reder (1969), using a neoclassical short-run model for analysing frictional unemployment, similar to Figure 3.2, utilised the imperfect information assumption and also added other assumptions. Both workers and employers were assumed to be expected utility maximisers. Further, each worker was assumed to know the probability distribution of utility levels associated with jobs offered to him/her after becoming unemployed. Reder assumed there are homogeneous wage rates and homogeneous quality of labour, and heterogeneous jobs and preferences by individuals.[6] The job seeker would have a minimum level of utility associated with a wage rate that determines whether the job seeker would accept or reject a job offer. We can determine that in the aggregate labour market unemployment will occur at equilibrium. Note that Figure 3.3 is similar to the neoclassical (monetarist) model presented in Figure 3.2. There is voluntary

Figure 3.3 Reder's Labour Market Model



Source: Reder, 1969, Figure 1, p.8.

[5] Under perfect information, the wage rate would be same for all workers.
[6] Heterogeneous refers to either workers having different skills or they are working at different jobs.

or frictional unemployment represented by the horizontal distance between the **Ls** curve and **Lf** curve. However, in Reder's representation of the labour market, there is also a notional labour demand **Lds**[7] and an effective labour demand **Lde**[8] resulting in frictional vacancies at equilibrium wage **W1**. Reder (1969, p.9) suggests that the resultant unemployment is neither the result of excess demand nor excess supply as in classical labour models:

> "Excess labor supply exists only if the actual unemployment interval exceeds the expected unemployment interval. Similarly, the presence of unfilled job vacancies does not imply excess demand for labor. In general, an equilibrium wage rate will require the presence of both unfilled vacancies and unemployment".

Hicks (1984a, p. 58) commented on this as an attempt by Reder to define frictional unemployment as purely a "supply phenomenon unrelated to the availability of suitable jobs which the frictionally unemployed could take". Finally, due to Reder's use of job utility in the model, there was an inability to verify this model with empirical data.

3.1.4 Other Unemployment Theories

Search theory appears to provide an acceptable explanation of some of the activities of the unemployed once they have lost their job. However, it is unable to explain why individuals become unemployed in the first place except to argue that all unemployment represents voluntary unemployment. In response to this shortcoming, the following theories are discussed.

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[7] Lds represents the number of jobs that need to be filled for the operation of the economy at a particular time.

[8] Lde represents the number of jobs on offer at a particular time.

3.1.4.1 Implicit Contract Theory

Implicit contract theory was developed to explain the informal understandings between firms and employees. One common feature of implicit contract literature (See Cothren, 1983; Newbery and Stiglitz, 1987; Arnott et al., 1988) involves an understanding that the firm will maintain existing nominal wages and pay cost-of-living wage increases except under severe economic conditions such as impending bankruptcy. In return for this guarantee, employers obtain the right to lay off workers in response to cyclical declines in the demand for their products. By providing protection against the wage decline during recessions, employers can attract workers at a lower average wage. Additionally, this contract provides firms with certainty in the reduction of the wage bill compared to the uncertainty associated with a wage reduction, which might cause some highly valued workers to quit. Finally, these contracts may produce positive "reputation effects" which may allow firms to attract better quality workers. Newbery and Stiglitz (1987, p. 416) noticed a problem with implicit contract theory at the time. Insufficient attention had been paid to the general equilibrium and the set of feasible contracts. They revealed that in the absence of assumptions of observability, enforcement, and complexity, implicit contract theory explains wage rigidity, but does not result in unemployment. However, by removing two of the three assumptions unemployment may result (ibid., p. 417).

3.1.4.2 Insider – Outsider Models

The development of insider-outsider models describes the fact that there are two groups of potential workers that firms must deal with (i) the insiders and (ii) the outsiders. The insiders are workers with some connection with the firm at the time bargaining, and whose interests are therefore taken into account in the contract. The outsiders are workers with no initial connection with the firm but may be hired after the contract is set (Romer, 1996, pp. 465-466). If there is considerable insider power, employment is reduced by raising wages causing firms to move their labour demand curves upward (ibid., 1996, p.468). However, the market has a mixture of insider and outsider power in the labour market. Doeringer and Piore (1971) used dual labour market theory to explain the labour market for insiders (the internal labour market) and outsiders (the external

labour market). Hicks (1984, p. 89) explained that jobs in the internal labour market are characterised by:

(1) employment stability and job security;
(2) high and rising wage rates;
(3) good working conditions; and
(4) chances for promotion.

However, the jobs in the external labour market are characterised by the following:

(1) employment is unstable and work turnover is high;
(2) wage rates are low and relatively stagnant; and
(3) job ladders are non-existent or severely restricted (ibid., p. 89).

Although the two markets are interconnected, the restriction of movement between markets results in the internal market jobs being shielded from the direct influence of competitive forces in the external market.

3.2 Types of unemployment

At any point in time, many workers are in between jobs. It requires time for workers to find a job and firms to hire workers. "Frictional unemployment arises because both workers and firms need time to locate each other and to digest information about the value of the job match" (Borjas, 1996, p. 439). Frictional unemployment leads to short-term unemployment (STU) spells and can be 'productive' as it improves the allocation of resources in the labour market. It is noted that frictional unemployment is usually associated with new entrants and reentrants to the labour market and they usually require time to find the right job.

Structural unemployment, however, can arise if job seekers lack the skills for the jobs available. Industrial sectors in the economy are growing or declining, and workers from

declining sectors are usually laid off. The job seeker sometimes cannot easily make the transition from the previous industry he/she worked in, as they may possess industry specific skills that growing industries are not interested in. As a result, these unemployed workers may require a considerable amount of time to re-skill. In New Zealand for example,

> "During recessions government departments were instructed to take on more school leavers regardless of whether the departments needed additional labour. In the process of putting departments into commercial footing in the late 1980s, surplus labour was discarded, and structural unemployment increased sharply" (Wooding, 1997, p. 263).

Also, the traditional protection (usually through tariffs) that domestic industries had received was reduced or removed, increasing competition from overseas competitors. Many domestic producers could not continue operating without making some employees redundant to reduce costs (Bollard, 1987, pp. 38-39).

"Cyclical unemployment arises when there is a decline in the level of economic activity so that output falls below potential GDP" (Scollay et al., 1989, p. 177). New entrants and reentrants find it difficult to get jobs and existing workers are made redundant due to pressure on firms to reduce costs. However, when the economy improves, more jobs become available and unemployment rates begin to decline.

It is difficult to determine just what proportion of unemployment in an economy is attributed to what type of unemployment. However, it is seen that they can become inter-related. New entrants to the labour market suffer frictional unemployment during times when the economy is growing. However, this could become cyclical if they enter at times of recession. It could also be structural when they enter only to find their skills have been made redundant before they ever find a job or only recently found a job.[9]

[9] See Ehrenberg and Smith (1994, pp. 566-581) for a brief overview of some causes for each type of unemployment.

3.3 Factors influencing unemployment duration[10]

In Section 3.2 the discussion focussed on how the unemployment duration varies with different types of unemployment. This section focuses on the factors that influence unemployment duration at a microeconomic level. When job offers are received by the job seeker, they are reviewed, and either accepted or rejected using some set of criteria. Under search theory a minimum wage level is used by job seekers to determine whether they would either accept or reject a job offer. This is called the asking wage.[11] Mortensen (1970) proposed a model that assumed the asking wage was constant, or independent of the unemployment duration. This overlooked the possibility that the asking wage will change through time as the job seeker adjusts his/her expectation of the wage rates that are likely to be available to him/her. McCall (1970) and Gronau (1971) both realised this and introduced their own models assuming the asking wage would decrease as the unemployment duration increased, but the cause was different for each model. McCall (1970) assumed the reason for the duration dependence of the asking wage was due to the job seeker possessing inadequate knowledge of the distribution of wages appropriate to his/her skills. However, the job seeker can revise the present wage distribution by using prior wage distributions and offers observed at present to determine a perceived wage distribution.

Gronau (1971) however, assumed the duration dependence of the asking wage was attributed to a reduction in time available for future employment, and therefore reduce future earnings. This assumption was based on the following:

> "Other parameters remaining constant, the factor responsible for the decline in the asking wage is the finite time horizon. The job seeker's time horizon depends on the time he expects to stay on his next job. Any prolongation of search will cut directly into the time spent on the next job. However, the length of search does not affect the duration of employment on the next job, but, given the finite life span, will necessarily affect the time spent on some subsequent jobs. Either way, any prolongation of the search reduces the gains to be expected from search" (ibid. p. 294).

[10] The discussion in this section uses job search theory as its foundation.
[11] Asking wage is also referred to as acceptance wage and reservation wage.

Hence, if the asking wage was too high, then the job seeker would experience long spells of unemployment duration until the asking wage was revised downwards to get a job. Kasper (1967) could not clearly determine if a job seeker's willingness to reduce their asking wage would increase the hazard rate[12]. However, these studies and others noted that another factor was influencing the unemployment duration.

Empirical studies, mainly concentrated in the 1970s, attempted to discover the actual effects of unemployment benefits on unemployment duration (Holen and Horowitz, 1974; Ehrenberg and Oaxaca, 1976; Classen, 1977; Holen, 1977; Crosslin and Stevens, 1977; Mortensen, 1977; Meyer, 1990). The overwhelming conclusion from the studies above was that providing unemployment benefits would lead to an increase in unemployment duration. This was due to the job seeker having search costs reduced, therefore enabling a thorough search for a job. Also, the job seeker would raise the asking wage level, contributing to an increase in unemployment duration. In countries like the United States, unemployment benefits have a limited duration. It has been observed that the hazard rates 'spike' near benefit exhaustion. Hence, exit probabilities from unemployment have been observed to increase near the time of benefit exhaustion. Stancanelli (1999), however, could not find statistical evidence to indicate that the hazard rates increased due to benefit exhaustion. This, however, does raise the issue of why exit rates increase near benefit exhaustion. At the time of benefit exhaustion, could the search intensity of the job seeker increase, thus raising the hazard rates?

Yoon (1981) found that unemployment for a job seeker was attributed to the time taken to find an offer and time taken to evaluate the offer. Yoon proposed that if the intensity of search by the job seeker increased, then there would be a reduction in time spent searching for job offers and therefore reduce unemployment duration. However, by raising the search intensity, the search costs for an offer would increase as a result of an increase in variable costs. Yoon's results found that unemployment duration would decrease with increased search intensity, and the associated increase in search costs.

[12] The hazard rate will be discussed in greater detail in Chapter 4.

However, as a cautionary note, increased search intensity costs could also result in increased unemployment duration.

> "The duration of unemployment is decomposed into: (i) the search time for an offer, and (ii) the unemployment duration due to rejection of offers. ... If the elasticity of mean search time for an offer with respect to search intensity is greater than –1, and less than 0, the increase in search cost as a result of an increase in the unit cost of search intensity could in fact, increase unemployment duration. This is because the first component of unemployment duration rises faster than the second one falls" (ibid., p.608)

This could insinuate a job seeker would keep their search intensity at what they would consider an acceptable level in their belief of attaining a job. This could result in a decrease in the job offer arrival rate, increasing search time for offers, and lengthening their unemployment duration.

Van den Berg (1994) examined the effects of changes in the job offer arrival rate on the exit rate out of unemployment. The job offer arrival rate was considered one of the main issues of concern for unemployment duration. Van den Berg goes further to explain:

> "Changing the job offer arrival rate has two opposite effects on the exit rate out of unemployment (also called the 'hazard') and therefore on the expected duration of unemployment. First, there is a positive effect on the hazard because of the increased expected number of occasions at which one is able to leave unemployment. Second, there is a negative effect because of the increased selectivity of the searcher in the face of this increased opportunity to leave unemployment" (ibid., p.479).

Hence, the net effect would determine if the hazard would increase or decrease, due to a change in the job offer arrival rate. However, no studies in New Zealand have utilised information of this variety or any of the other important factors either. So far this section has been important in identifying key factors, which affect the unemployment duration. However, there is one requirement of unemployment duration models that needs to be discussed.

Salant (1977) noted that for estimated parameters to be unbiased, observations on unemployment duration needed to be complete spells. If they were of an interrupted nature, i.e., the job seeker's unemployment duration was still in progress, parameters would suffer from both interruption and length bias. Interruption bias describes how spells on average would be captured halfway through their full length at the time of survey. "Length bias referred to spells with longer than average full lengths that are more likely to be in progress at the time of survey – a phenomenon known as sampling" from the population (ibid., p. 40-41). Hence, the need for a measure of complete spell length, or average completed spell of unemployment duration (ACD), was required to accurately estimate unemployment duration. The average interrupted spell of unemployment duration (AID) and ACD are related in the following way (ibid., p. 41):

$$\frac{AID}{ACD} = \frac{1}{2}\left\{\frac{Var\ C}{ACD^2} + 1\right\} \qquad (3.1)$$

The implications of the above equation are:

> "It can be seen that – as long as the variance of completed spell length is negligible (relative to the square of the mean length) – length bias is unimportant and the expected length of interrupted spells will be half the expected length of complete spells. On the other hand, if the variance of full spell length is sufficiently large, the effect of length-bias can predominate, and the expected interrupted length can actually be the larger of the two numbers" (ibid., p. 42).

So, if the variance of a completed spell is negligible, AID = ½(ACD). Also, the bias that is dominant would have to depend on the hazard rates. This raises the following situations.

- If hazard rises with time unemployed, AID < ACD.
- If hazard is constant AID = ACD.
- If hazard falls with time unemployed, AID > ACD.

This approach by Salant reveals the importance of completed unemployment duration data when using it in unemployment models. Now the focus shifts to the use of long-

term unemployment profiling and how providing early assistance could reduce the unemployment duration.

3.4 Long-term Unemployment

3.4.1 Long-term Unemployment – Hysteresis

In many OECD countries, the overall rise in unemployment since the mid-1970s has been associated with an increase in LTU. Hysteresis was one of the major explanations for the rise in unemployment rates.

> "The concept of unemployment hysteresis is that the so-called 'natural' rate of unemployment tends to follow the development over time in the actual unemployment rates, so that in periods where the unemployment rises, the 'natural' rate will also rise. While conventional macroeconomic analysis usually takes the 'natural' rate of an economy as being constant, the hysteresis approach argues that sustained high levels of unemployment results in changes in the structural features of the economy such that the natural rate will rise" (OECD, 1987, p. 178).

With hysteresis, not only does the unemployment rise, but also the LTU increases. Gardiner (1995, pp. 68-69) explained why LTU has such a problem decreasing. First, LTU is related to heterogeneity among job seekers. Factors such as age, gender, skills and ethnicity would affect the job seekers chances of obtaining a job. Hence, some job seekers have higher chances of obtaining a job than other job seekers because a different characteristic may provide a higher probability of exit. However, those with low exit probabilities would find their unemployment duration increasing. During the time of unemployment, the exit probability will fall. Second, it is argued that as the exit rates fall, the job seeker becomes demoralised due to their lack of success, and employers may find the job seeker unsuitable for employment. The employer uses the duration as a screen that other employers have turned the job seeker down due to poor expected productivity. Therefore, the longer duration continues, the exit rates decrease. There is sufficient evidence to suggest that heterogeneity effects and duration dependence are complementary when explaining the decline in exit rates from LTU.

Rising unemployment levels are usually the case during recessions, but LTU does not rise until one or two years later. Then the pool of LTU increases along with unemployment due to increasing inflow and decreasing outflows. However, when the economy begins to recover, unemployment levels may decrease, but LTU levels continue to rise for another one or two years. This is attributed to employers gaining some confidence to begin hiring, but they will only focus on the recent or short-term unemployed. Only when there has been consistent economic growth does the employer begin to hire long term unemployed. This is reflected in decreasing levels of LTU with an increase in outflows. However, Chapman (1993) noted that rapid economic growth might not be enough by itself to reduce LTU.

3.4.2 Long-term Unemployment Profiling

The OECD (OECD, 1998), studying the effectiveness of active labour market policies (ALMPs) in four countries (Australia; Canada; United Kingdom and; United States), suggested that ALMPs should be targeted to the needs of individual job seekers as early as possible in the unemployment spells. Australia and the United States utilise formal profiling based on statistical models. In Australia, this model is used to identify job seekers with the highest risk of LTU using predictors such as: age, educational attainment, Aboriginal status, birth in a non-English speaking country, disability, English speaking ability and geographical location. The public employment service staff who can use their judgement to assess other factors such as poor motivation also complements this. In the United States the job seeker is profiled to estimate the probability the job seeker exhausts his/her unemployment benefit entitlements. Only five variables are used: level of education, job tenure, change in employment in previous occupation and previous industry, and the local unemployment rate. Other personal characteristics such as ethnicity are not included due to civil rights legislation, and the judgement of the staff is also not included (ibid., pp. 13-14).

A major issue of a statistical model is its accuracy. The OECD (1998, p. 15) identified two problems if the model is not accurate: (1) job seekers may be selected for assistance

who may not need it, leading to wasted resources, and; (2) job seekers who need assistance might not be selected. Problems with the predicted power of the models had also arisen (ibid., p. 16):

> "Evidence from the United Kingdom suggests that the predictive accuracy of models is low and that it would be difficult to devise a satisfactory profiling model... Evidence from Australia and the United States confirms that operational profiling systems are subject to a varying degree of inaccuracy and misinterpretation".

Harris (1996), using a model to estimate flows into and out of unemployment, also found that the major influence on LTU was the increase in the inflow rather than a fall in the outflow rate from LTU. The Prime Ministerial Task Force on Employment (1994, p. 95) also questioned whether the needs of unemployed are being determined at the appropriate time:

> "Some of the characteristics which made long-term unemployment more likely, such as low qualifications, could be identified at an earlier stage and assistance targeted before the person has the additional disadvantage of being long-term unemployed. Individuals may not always be receiving the type or level of assistance which is appropriate for them. People who are long-term unemployed are not a homogeneous group and face a range of different barriers to employment, which should be reflected in policies that identify those who need assistance most and tailor assistance more closely to their individual characteristics".

However, the New Zealand Employment Service (NZES) provided assistance programs to registered unemployed that are identified long-term unemployed at the time. The recent and short-term unemployed were left unassisted to find jobs themselves. Hence, the policy of the NZES would have to be revised, and a means of identifying individuals that register as unemployed created to identify if they are at risk of LTU spells.

In unemployment duration models, survival time is the spell of unemployment, i.e., the time taken for a job seeker to gain employment. Survival times are restricted to being positive and the data often contains censored observations (observations for which at the end of a reference period the event has not occurred). Central to the analysis of survival

times are two functions used to describe the distribution: the survival function and the hazard function. The survival function S(t) is defined as the probability that an individual survives longer than period t, or S(t) = Pr(T>t), where T denotes the survival time. If a data set shows 20,000 observations with unemployment duration of 27 weeks or more and 15,000 observations with unemployment duration of 52 weeks or more, than the probability that an individual job seeker remains unemployed past the 27^{th} week is estimated to be S(27) = 75%. The graph of S(t) versus t is known as the survival curve and it is generally negatively sloped. From such curves, researchers can estimate the probability that an individual with a given set of demographic characteristics will survive past a given set of time. However, the hazard function h(t) is defined as the probability that a job seeker escapes unemployment within the next time unit, given that the job seeker has survived up to the beginning of this interval. Empirically, it is assumed that the survival and hazard functions are adequately captured by the exponential and Weibull distributions (Heckman and Singer, 1984; Van den Berg and Ridder, 1998; Chuang, 1999). The computer software SAS has a routine for such analysis.

3.4.3 Long-term Unemployment – Empirical Models

As mentioned earlier, the major influence on LTU was the increase in inflow rates to LTU. The early identification of potential long-term unemployed would reduce such a problem. Hence, empirical studies by Gardiner (1995), Payne et al. (1996) Watson et al. (1997) and Van den Berg and Ridder (1998) provide insight into models developed to identify potentially long-term unemployed from recently unemployed by using certain demographic characteristics.

Gardiner (1995) calculates the exit probability function (EPF) or hard function using NZES data covering the period July 1989 to June 1993. He analyses the EPF to see if its shape and/or level changed over time and whether individuals with different characteristics have different hazard rates. The EPF for 1993 is examined in detail to determine the different hazard rates for the different demographic groups. The data contained censored observations and the approach taken in the exit probability analysis is

equivalent to estimating a hazard function to generate the probability that an individual who has reached a specified duration will leave the unemployment register within the following week. The EPF declines as the duration increases, implying that the longer a job seeker remains unemployed, the chances of leaving unemployment the following week decrease. The decline in EPF could also be attributed to certain individual characteristics underlying a lower exit probability. The results also revealed that there were spikes at nine, 26 and 52 weeks duration on the EPF. The nine weeks duration spike reflects an automatic computer program which lapses non-beneficiaries who have not contacted the NZES within the previous eight weeks. The second two spikes, "at 26 and 52 weeks duration respectively, reflect the timing of work focus interviews and in the main that many registered unemployed cannot be contacted for the interview and are lapsed for not attending their interview" (ibid., p.69).

The conclusion of the results was that the model had poor predictive power, and Gardiner admitted this result was not surprising, since the variables available had displayed fairly low explanatory power in preliminary analysis. This was based on a disaggregated EPF according to gender, age group, ethnicity, educational qualifications and regional location, stored on the NZES database. Additional explanatory variables like previous job income, relationship status (i.e., single/married/de facto), the number of dependents and local labour demand conditions were suggested as being able to raise the explanatory and predictive power of the model.

Payne et al. (1996) created a model that investigated whether job seeker characteristics could help in the identification of people who would become long-term unemployed. Since job seekers that were registered as unemployed could receive the help, they focussed on registered unemployed using both the National Child Development Study (NCDS) and Retirement Study data in Britain. The NCDS data was restricted, with age being confined to between 23 and 33, covers the period 1981 – 1991 and had relatively poor information concerning ethnicity. The Retirement Study data was restricted with age being over 50, covering the period of 1970 – 1988, and ethnicity information was not collected. Using a logistic binary model the prediction performance of the model for

both separate sets of data was relatively poor. The causes identified for the poor performances of the models were put down to small sample sizes, and the need to use a wider age group with good information on ethnicity.

Van den Berg and Ridder (1998) produced an equilibrium search model that has strong implications for the distribution of unemployment and job spells given the wage earned in the job. Both job and unemployment spells follow an exponential distribution, and the job duration hazard decreases with the increases in wages. They also produced a mixed proportional hazard model with Weibull duration dependence with the intention of attaining the overall shape of the hazard rates, although they did not consider the shape of the hazard important.

Watson, et al. (1997) utilised the survival curve approach to investigate the relationship between job seeker characteristics and unemployment duration spells in New Zealand. This was similar to the model produced by Van den Berg and Ridder (1998). This involved a data set comprising 300,000 cases covering the period January 1995 to February 1997 containing censored observations. This data set was obtained from the NZES database. By assuming the relationship between duration and survival was captured by the Weibull distribution, the survival curve could take on the form

$$S(t) = \exp[-\exp(\mu/\sigma) * t^{1/\sigma}] \qquad (3.2)$$

Where μ and σ are parameters that are estimated based on the data (ibid., p. 53). Watson et al. proposed the higher the survival curve, the higher the proportion of long-term spells, while short-term spells would have a high proportion in the lower continuance curves, based on the characteristics of the job seeker. However, the model did not identify accurately which NZES job seekers were likely to become long-term unemployed. The demographic characteristics used were not sufficiently related to spell duration and the prediction of the LTU cases always included a high proportion of short-term spells. Watson et al suggested the collection of additional information could prove useful for improving the model in identifying LTU risk for registered job seekers.

3.5 Concluding Comments

Long-term unemployment has been identified as a problem that can be resolved by two means. Providing assistance to the long-term unemployed once they have been identified when their unemployment spell is 27 weeks or more, like in New Zealand. Studies have found that this is ineffective and a second means of assistance is more appropriate. This second approach of identifying long-term unemployed by profiling individual job seekers when they first register has been identified as an ideal approach in the reduction of LTU. However, empirical studies have experienced problems through lack of explanatory and predictive power by their respective models. In the next chapter, components of these models are drawn together to remedy these difficulties.

CHAPTER FOUR

Data Collection and Methodology

4.0 Introduction

The previous chapter discussed empirical studies that had utilised various approaches to modelling LTU, including the logit model. In section 4.1 I will discuss why the logit model was chosen and introduce the empirical model used in this study. In section 4.2 the discussion focuses on the definition of LTU that is employed in this study, and the data and variables used to estimate the model. Finally, section 4.3 summarizes the discussion of this chapter concerning the data and methodology.

4.1 The Analytical Method

All of the cases in the data sample have completed unemployment spells. Hence, the cases in the sample can be arranged easily into either LTU or STU categories. This nature of the data dictates use of a binary-model. This study, therefore, attempts to fit a binary model to the data on a sample of unemployed kept on the NZES database. In binary-choice models the dependent variable is both discrete and dichotomous in nature, and either takes the value 1 if an event occurs, or 0 in the absence of the event. In New Zealand, a period of unemployment equal to or longer than 27 weeks is considered a period of LTU.[1] Applying this definition to the model, the dependent variable would take the value 0 if the job seeker were unemployed for less than 27 weeks and 1 if the job seeker were unemployed for 27 weeks or longer. The objective of the model would be to estimate the probability that an unemployed individual, given a set of personal attributes, would be long-term unemployed.

As mentioned previously, the model has a discrete and dichotomous dependent variable. The model could econometrically be solved as a linear probability model (LPM) by

[1] LTU defined as 27 weeks or longer by the Household Labour Force Survey (Statistics New Zealand, 2000).

applying ordinary least squares (OLS). This is represented by the relationship of LTU to the explanatory variables, using the typical LPM.

$$P_i = E\,(Y = 1/X_i) = \beta_1 + \beta_2 X_{i2} + \ldots + \beta_k X_{ik} \qquad (4.1)$$

where P_i is the probability that individual *i* is long-term unemployed, X is a particular attribute of the individual, Y = 1 means an individual is long-term unemployed, β_1 is the intercept of the model and β_k is the slope of the explanatory variable k. Hence, using the categories explained in section 4.2 below, the model we obtain is:

$$P_i = \beta_1 + \beta_2 \text{Gender} + \beta_3 \text{Ethnicity} + \beta_4 \text{Qualification} + \beta_5 \text{Region} + \mu \qquad (4.2)$$

However, with the binary dependent variable the LPM suffers from three problems: (i) heteroskedasticity[2]; (ii) the duration probabilities fall outside the permitted range of [0, 1] and; (iii) the assumption that the marginal effect of an explanatory variable remains constant. The heteroskedasticity problem could be resolved by transforming the data to ensure homoskedasticity.[3] However, to resolve problem (ii) and (iii) we require a probability model that could (i) ensure estimated probabilities would lie between the [0, 1] interval and; (ii) the relationship between the explanatory variable and duration probabilities is non-linear. Gujarati (1995, p. 544) suggested using cumulative distribution functions (CDF) that were either (i) logistic (logit model) or (ii) normal (probit and tobit models) in nature to satisfy the requirements of points (i) and (ii). However, to resolve these problems, a choice had to be made concerning which model to use: the probit, logit or tobit model.

First we remove the possibility of using the tobit model as this model is essentially used for censored data.[4] As mentioned previously, the data being used has completed unemployment durations. Hence, the data does not require censoring so therefore the

[2] Heteroskedasticity is the phenomenon where variance changes when coefficient X changes, thus producing biased estimator of β_k.

[3] For a complete description of the transformation process see Griffith et al. (1993, pp. 486-490).

tobit method of estimating the model is not required. Although the probit and logit models give similar results, the logit model is preferred. Gujarati (1995, p. 569) noted in the probit the rate of change in the probability is "complicated and is given by $\beta_j\phi(Z_i)$, where $\phi(Z_i)$ is the density function of the standard normal variable and where $Z_i = \beta_j X_k$'. β_j is the coefficient of the j^{th} regressor". However for the logit model. "the rate of change in the probability is given by $\beta_j P_i(1-P_i)$" (ibid, p. 569). Hence, although all the regressors are involved in the computing of the changes in probability, the logit approach is relatively simpler than the probit approach. Also, the logit model is not in integral form like the probit model and it makes the logit model easier to work with (Griffiths et al., 1993, p. 751). Pindyck and Rubinfeld (1991, p. 256) deem the logit model to be more appealing than the probit model. Given these statements the decision was made to use the logit model for estimating the LTU model.

To motivate the logit model assume there is a continuous index Z_i which ranges in value from $-\infty$ to $+\infty$ and which is determined by the set of explanatory variables that will be used. Therefore,

$$Z_i = \beta_1 + \beta_2 X_{i2i} + \ldots + \beta_k X_{ik} \quad \text{where } i = 1, \ldots, N \qquad (4.3)$$

or

$$Z_i = \mathbf{X_i}' \beta$$

where $\beta = [\beta_1 \ \beta_2 \ \ldots \beta_k]$ and $\mathbf{X_i}' = [1 \ X_{i2} \ X_{i3} \ \ldots X_{ik}]$.

As mentioned earlier, due to the data being of a binary nature, the dependent variable is a dummy variable taking the value 1 if an individual job seeker is long-term unemployed, and the value 0 if the individual is short-term unemployed. Assuming Z_i is a logistic random variable, the probability that an individual would be long-term unemployed given his or her given attributes can be computed from the logistic CDF evaluated at Z_i:

[4] A sample in which information on the dependent variable is available for only some observations is known as a censored sample (Gujarati, 1995, p. 572).

$$P_i = F(Z_i) = 1/[1 + \exp(-Z_i)] \quad (4.4)$$

Where P_i is the probability that individual i is long-term unemployed and F(•) is the logistic CDF at a specific estimated value. As Z_i ranges from -∞ to +∞, P_i ranges between 0 and 1 and that P_i is nonlinearly related to Z_i (or X_i), satisfying the two requirements specified earlier. However, due to P_i having a non-linear relationship, not only to X but also to the β coefficients, the OLS procedure cannot be used to estimate the parameters. The following procedure, however, compensates for this problem.

If P_i is the probability of being long-term unemployed given by equation (4.4), then (1 - P_i), the probability of being short-term unemployed, is

$$1 - P_i = 1/[1 + \exp(Z_i)] \quad (4.5)$$

Therefore, we can write

$$P_i / (1 - P_i) = [1 + \exp(Z_i)] / [1 + \exp(-Z_i)] = \exp(Z_i) \quad (4.6)$$

Now $P_i/(1-P_i)$ is the ratio of the probability that an individual will be long-term unemployed to the probability that the individual will be short-term unemployed – or the odds ratio that an individual will be long-term unemployed. Taking the natural logarithm of (4.6), we obtain

$$\begin{aligned} L_i &= \ln[P_i / (1 - P_i)] = Z_i \\ &= \beta_1 + \beta_2 X_{i2} + \ldots + \beta_k X_{ik} \end{aligned} \quad (4.7)$$

That is, L, the log of the odds that an individual will be a long-term unemployed, is not only linear in X, but also linear in the parameters. Hence, L is called the logit. As P goes from 0 to 1, Z varies from -∞ to +∞ and the logit L goes from -∞ to +∞. The regression coefficients are estimated using the method of maximum likelihood, using the iterative procedure, the Newton-Raphson method. "The properties of the log-likelihood function

for ... the ... logistic c.d.f's guarantee that this method will converge to the global maximum based on any set of starting values $\hat{\beta}_0$" (Judge et al., 1988, p.792).[5] A given slope coefficient shows how the log of the odds that an individual will be a long-term unemployed changes as the corresponding explanatory variables changes by one unit, or as an attribute differs from that of the base category. The statistical significance of the slope coefficients will be assessed from their respective t-ratios. A test of the hypothesis that all of the coefficients in the model are zero will be assessed via the likelihood ratio test (LRT), where the chi-square statistic has k-1 degrees of freedom.

However, trying to logically comprehend and explain what the log-odds mean is difficult. To simplify the log-odds results, Gujarati (1995, p. 559) suggests taking the antilog of the slope coefficient, to indicate the effect of each explanatory variable on the odds of being long-term unemployed. Subtracting one from the antilogs and multiplying the results by 100 would give the percent change in odds corresponding to a change in one unit of the explanatory variables. Taking equation (4.7) we apply these changes:

$$\begin{aligned} \ln[P_i / (1 - P_i)] &= L_i \\ P_i / (1 - P_i) &= anti \log L_i \\ P_i &= (1 - P_i)\ anti \log Li \\ P_i &= anti \log L_i - P_i\ anti \log L_i \\ P_i(1 + anti \log L_i) &= anti \log L_i \\ P_i &= anti \log L_i / (1 + anti \log L_i) \end{aligned} \qquad (4.8)$$

where L_i is the estimated value of the response variable from the regression for individual *i*. Hence, the results would easily be interpreted based on the percent change in odds calculated from slope coefficients by multiplying the result of equation (4.8) by 100. An example of the application of this equation to coefficient data can be seen in Chapter 5, Section 2.

[5] For further explanation concerning the Newton-Raphson procedure see Judge et al. (1988, Chapter 12,

4.2 The Data and Sources

The data used for this analysis are on unemployment spells for job seekers who enrolled with the NZES during the period October 1988 to December 1997. A random sample of 100,000 cases of completed unemployment spell duration was extracted from the administrative database of the NZES, maintained by the New Zealand Department of Labour (DOL). Due to problems for the DOL in integrating the data for Work and Income New Zealand (WINZ) and the data of its predecessor, the NZES, to make one continuous series the observations were constrained to 1997.[6] Also, the data records the effective periods of unemployment registration rather than actual periods of unemployment. This means, for example, that a person lapsed off the register for a short time for administrative purposes would be treated as continuously registered. The effective date is used wherever available. For each observation information was collected on job seeker characteristics (date of birth, gender, ethnicity, highest educational level and regional location of office registered in) and the start date and end date of the individual's unemployment spell.

The difference between the Start date and End date will provide the duration of unemployment, in weeks, for each observation. As mentioned previously, these are considered effective periods of unemployment rather than actual. Age is the only continuous variable used in this analysis and is determined from the date of birth and the start date. To be a member of the New Zealand labour-force, the minimum age of a participant is 15 (Wooding, 1997, p. 9). To reflect this requirement, unemployment spells of persons aged less than 15 years were deleted from the data sample. The remaining variables are discrete in nature, and require dummy variables to explain the various qualitative characteristics and attributes of the registered individual. Gender identifies whether the individual is either male or female. Ethnicity is defined by self-identification by the individual. Education is measured as the highest level of education received. Finally, regional location is classified according to which regional council area the job seeker is registered in. For dummy variables, there is a need to have one less

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especially pp. 792-795).

[6] Personal correspondance A. Reynolds September 14, 1999 (Labour Market Policy Group, Department of Labour).

variable than the total number of variables in a particular categorical variable needed to avoid multicollinearity.[7] Also, the results derived for the explanatory variables are in relation to the variable omitted – the base variable. Table 4.1 summarises the variables selected to act as the base variable for each categorical attribute.

TABLE 4.1 BASE VARIABLE FOR CATEGORICAL ATTRIBUTES

Category Name	Base Variable
Gender	Male
Ethnic Group	New Zealand European/Pakeha
Educational Qualification	University degree or professional qualification
Regional Location of NZES Office	Wellington

The male variable was chosen at random for the gender base variable. New Zealand European/Pakeha was chosen as the base variable for the ethnic category as that group exhibits the lowest LTU rates relative to the other ethnic groups and results are expected to indicate that all other ethnic groups are relatively disadvantaged compared to the base category. For educational qualifications, 'Degree or professional qualification' was chosen due to this category being the highest attainable form of qualification. The expected results would indicate that registrants with no qualifications or lower forms of qualifications (i.e. School Certificate) have a higher risk of being long-term unemployed than those with the base qualification. Hence, the higher the level of education received, the lower the risk of unemployment, and also of being long-term unemployed. Wellington was chosen as the base regional location at random.

Table 4.2 summarizes the explanatory variables used when the model in equation (4.8) is expanded:

[7] If a model has several variables, and some of the explanatory variables are approximately linearly related this is known as multicollinearity. If it is present, the regression model has difficulty telling which explanatory variable(s) is influencing the dependent variable (Judge et al., 1988, pp. 859-860).

TABLE 4.2 DEFINITION OF VARIABLES

	1	0
FALE	If female	If male
SMAO	If Sole Maori	Otherwise
MMAO	If Mixed Maori	Otherwise
PACI	If Pacific Island	Otherwise
OTHE	If Other Ethnicity	Otherwise
LT3Y	If no formal school or less than 3 years secondary schooling	Otherwise
L3SC	If less than three School Certificate passes or equivalent	Otherwise
M3SC	If three or more School Certificate passes or equivalent	Otherwise
HSC6	Sixth Form Certificate, University Entrance or equivalent, Bursary, Higher School Certificate	Otherwise
PSTR	If post secondary or trade qualification	Otherwise
OTHS	If other school qualification	Otherwise
EAST	If registered in East Coast	Otherwise
AUKS	If registered in Auckland South	Otherwise
AUKC	If registered in Auckland Central	Otherwise
AUKN	If registered in Auckland North	Otherwise
CANT	If registered in Canterbury	Otherwise
NELS	If registered in Nelson	Otherwise
WAIK	If registered in Waikato	Otherwise
CENT	If registered in Central	Otherwise
NORT	If registered in Northland	Otherwise
SOUT	If registered in Southern	Otherwise
BOP	If registered in Bay of Plenty	Otherwise
TARA	If registered in Taranaki	Otherwise
AGE	Age in years	

Finally, to make it easier to discuss the results that will be obtained, LTU27 will be used for results for the model where LTU is defined as 27 weeks or more. LTU52 will be used for the model where LTU is defined as 52 weeks or more.

4.3 Concluding Comments

Due to the binary nature of the data, and its simpler approach compared to the probit model, the logit model was chosen to fit to the data. The estimates from the logit model can allow the estimation of the probability that an individual job seeker with a certain set of attributes will become long-term unemployed. This study will analyse two models using two different definitions of LTU:

1. LTU27 – a spell of unemployment lasting 27 weeks or longer; and
2. LTU52 – a spell of unemployment lasting 52 weeks or longer.

Due to the discrete nature of all but one of the explanatory variables, dummy variables needed to be used. The results of the LTU27 and LTU52 models are discussed in the next chapter.

CHAPTER FIVE

Results and Interpretation

At present, people have to be unemployed for a period of time before they become eligible for certain programmes designed to help them back into work. We try to develop a practical method of identifying people at high risk of long-term unemployment when they first register as unemployed. If this can be done, then, subject to other policy and funding considerations, such people might be offered special help early on.

(Payne et al, 1996, p. 114)

5.0 Introduction

The econometric software SHAZAM was used for the computations involving two logit models that differ through the different definitions of LTU. LTU as defined by 27 weeks or more used in New Zealand is employed to estimate coefficients of the regressions for the various years and the whole period 1988-97 (see Appendix C, Tables C.1A and C.1B). Also, a regression using LTU as defined by 52 weeks or more used by the OECD for the period 1988-97 is analysed (see Appendix C, Tables C.2A and C.2B). The results for these two models are reported in Table 5.1 and Table 5.2 respectively. Observations were skipped if the information required was either 'Not Recorded', a period (.) was recorded, or simply missing. Of the original sample of 100000, 91700 observations were retained in the analysis. Those removed were mostly from the first two years and the last year of the sample (see Appendix B, Table B.1). The mean duration of unemployment and the average age of the sample for the various years and for the average of the period 1988-97 are presented in Appendix B, Table B.2. The average age of the unemployed in the sample was approximately 29 years of age. The average completed unemployment duration was approximately 30 weeks. Finally, a data summary in Appendix B, Table B.3 revealed that:

1. All ethnic groups except for 'Other' ethnic group, had a mean duration of less than 27 weeks;
2. Males had a mean duration greater than 27 weeks duration, but females had a mean duration less than 27 weeks;
3. Job seekers with no formal schooling or less than three School Certificate passes had mean unemployment duration greater than 27 weeks, while the remaining education categories had unemployment duration less than 27 weeks;
4. Finally, job seekers in all the regions, except Nelson, had a mean duration of unemployment greater than 27 weeks.

Section 5.1 is an analysis of the results obtained for the LTU27 model. Section 5.2 is an analysis of the results for the LTU52 model. Section 5.3 is a comparison of the results for the LTU27 and LTU52 models. Finally, in Section 5.4 I use the predictive power of the models to determine whether the current attribute information collected by the New Zealand Employment Service database when a job seeker registers is adequate for identification of the long-term unemployed.

5.1 Analysis of LTU27 model results

Table 5.1 reports the percentage changes in the odds of being long-term unemployed calculated from the coefficients for the various years and the period 1988-97. The percentage change in odds (PODS) simplifies the interpretation of the regression results. Based on the PODS being positive or negative, one could determine if a job seeker is more or less likely to experience LTU compared to the base category.

For the 1988-97 results and the individual years, many of the coefficients are statistically insignificant at the 10% level. Four variables – 'Sixth Form Certificate, University Entrance or equivalent, Bursary, Higher School Certificate', 'Post secondary or trade qualifications', 'Other school qualifications' and Northland - were found to be statistically insignificant at the 10 % level for the period. The chi-square values for the

likelihood ratio test, however, were greater than their critical values (except for 1997). This indicates that the coefficients are definitely not equal to zero, rejecting the null hypothesis that the coefficients are equal to zero. However, this does not indicate a

TABLE 5.1: PERCENTAGE CHANGES IN THE ODDS OF AN INDIVIDUAL BEING LONG-TERM UNEMPLOYED - LTU27

Variable	Year or Period										
	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1988-1997
Age	0.00	1.65	0.59	0.70	0.49	0.15	0.47	0.16	0.57	-0.20	0.00
Gender											
Male	#	#	#	#	#	#	#	#	#	#	#
Female	-14.77	-24.42	-25.86	-36.49	-24.34	-29.00	-24.41	-28.93	-31.93	-15.39	-29.29
Ethnic Group											
NZ European	#	#	#	#	#	#	#	#	#	#	#
Sole Maori	-8.44	-7.03	34.97	44.92	23.05	32.21	35.35	32.50	8.82	11.95	20.93
Mixed Maori	-31.33	-7.91	9.60	13.17	12.17	27.54	19.58	8.83	9.64	12.60	8.31
Pacific Island	-28.96	-21.40	8.87	31.21	24.63	47.74	25.30	8.26	-3.31	8.28	8.76
Other	-26.11	0.00	-15.62	-11.59	-11.70	18.44	2.39	25.49	4.93	25.48	-12.22
Qualification											
Degree or professional qualification	#	#	#	#	#	#	#	#	#	#	#
Less than 3 years secondary school/ No formal school	-6.00	6.88	13.32	28.63	36.68	33.64	45.94	24.32	25.86	-14.09	32.82
Less than 3 School Cert. passes.	-34.25	-24.47	3.95	22.41	16.53	22.13	26.32	5.21	-2.71	6.89	13.97
Three or more School Cert. Passes.	0.00	0.00	-9.83	6.10	4.70	3.23	7.11	-3.39	4.05	-10.87	0.00
6th Form Cert., UE, Bursary, HSC.	-46.89	-7.63	-13.45	0.79	3.18	5.73	23.59	-3.51	0.39	-10.73	3.97
Post Secondary/ Trade qualification	-5.07	17.20	-16.27	0.94	-1.74	-4.05	7.99	3.07	-11.38	-23.01	3.01
Other school qualification	-45.66	-12.28	10.84	-17.04	-5.55	2.46	7.91	3.05	-4.35	-4.00	-0.23
Regional Office											
Wellington	#	#	#	#	#	#	#	#	#	#	#
East Coast	0.00	-15.54	-36.93	-19.07	-16.00	-30.35	-18.24	-6.05	-11.03	-14.33	0.00
Auckland	41.12	12.71	0.00	-10.66	-7.97	-27.55	-31.70	-15.44	-23.96	-28.45	-14.53
Canterbury	0.00	0.00	-10.44	-3.91	4.04	-4.78	-26.75	-8.79	-27.96	9.16	0.00
Nelson	-28.10	-42.68	-28.97	-11.57	-17.21	-21.24	-34.06	4.17	-16.25	-8.03	-22.28
Waikato	-21.36	-22.76	-14.76	2.62	-18.17	-21.74	-24.90	-0.99	-28.14	-31.41	-16.70
Central	0.00	-26.35	-34.61	-10.46	-5.25	-27.01	-33.55	-19.13	-21.52	-5.66	0.00
Northland	24.27	-1.73	-0.20	18.95	18.21	-7.62	-9.09	-1.09	-29.44	-17.14	-3.61
Southern	-43.08	0.00	-15.76	-19.71	-3.11	-24.32	-24.14	-12.09	-30.46	-1.50	-22.04
Bay of Plenty	-3.93	-16.56	-8.23	-9.06	-6.44	-14.59	-29.99	-29.94	-36.55	-25.05	-20.41
Taranaki	-2.40	-10.05	-24.46	-7.30	-1.62	-24.89	-24.57	-11.81	-15.38	-37.87	-18.50
Intercept											
Constant	-52.86	0.00	-38.50	-31.22	-41.64	-36.57	-54.54	-50.74	-53.05	-82.65	-45.25

goodness of fit of the data to the model.

Maddala (1983) suggested using a variation of the R-squared goodness of fit usually reserved for linear models. Since logit models use maximum likelihood estimation to obtain the estimated coefficients, the log-likelihood was used to estimate a R-squared statistic:

$$R^2 = 1 - (\frac{LL(0)}{LL(\beta)})^{2/N} \quad (5.1)$$

where LL(0) is the log value maximised with respect to the constant and LL(β) is the maximum likelihood with respect to all parameters (constant and the coefficients) and n represents the sample size. However, the Maddala R-squared statistic lies within the range

$$0 \leq R^2 \leq 1 - (LL(0))^{2/n}$$

"This obviously does not provide a goodness-of-fit, because even if the model fits perfectly, the resulting R-squared will be much less than 1" (ibid., p. 40).

Maddala suggested using a better R-squared statistic defined as:

$$pseudo\ R^2 = \frac{1-[LL(0)/LL(\beta)]^{2/n}}{1-[LL(0)/L_{\max}]^{2/n}} = \frac{[LL(\beta)^{2/n} - LL(0)^{2/n}]}{1-LL(0)^{2/n}} \quad (5.2)$$

Cragg and Uhler (1970, p. 400, cited in Maddala, 1983, p. 40) first implemented this equation. The R-squared values (reported in Appendix D) were relatively low, even for R-squared statistics of this nature. Hence, it could indicate that the model poorly fits the data.

5.1.1 An example of LTU profiling

The results displayed in Table 5.1 are adequate for indicating particular job seeker characteristics that have a higher percentage change in odds of LTU. However, to estimate the percentage odds that a given individual would be long-term unemployed, the estimated coefficients for the relevant dummy variables and for the age of the individual are substituted into the following equation. For example, using the regression results for the 1988-1997 data (see Appendix C, Table C.1B), the probability of being long-term unemployed for a female Pacific Islander aged 35 with less than three school certificate passes residing in Auckland can be calculated in two steps using equation (4.8) from Chapter 4:

$$L_i = -0.60235 - 0.34655 + 0.08400 + 0.13079 - 0.15703 + 0.00470(35)$$
$$= -0.72664$$

$$P_i = \text{antilog } L_i / (1 + \text{antilog } L_i)$$
$$= 0.48353 / 1.48353 = 0.3259$$

Based on this example, this individual has about a 33% risk of being long-term unemployed. We now turn our attention to the interpretation of the information in Table 5.1, which presents the percentage odds of being long-term unemployed for the various years.

5.1.2 Analysis by Age

The coefficient of the AGE variable indicates that older job seekers are more likely than younger job seekers to experience LTU. The percentage odds for LTU either do not increase, or increase by approximately 2% as age increases by one year. This result indicates the percentage odds of being long-term unemployed, is non-decreasing. This is consistent with comments by Fletcher (1995a, p. 32) that young job seekers are more likely to experience many short-spells of unemployment and have higher unemployment

rates than their older counter-parts. Older job seekers tend to have lower inflow rates, but also have lower exit rates, hence, longer unemployment duration and LTU.

5.1.3 Analysis by Gender

The results for gender indicate that the odds of LTU ranged from 15% to 36% higher for males in relation to females. When females leave the employment status, they tend to leave the labour force, becoming non-participants rather than unemployed (Grimmond 1993, p. 75). Statistics for female LFPR in New Zealand (see Table 2.1) also support these results. The LFPR for females has been lower than LFPR for males throughout the period. This indicates that females, moving from a state of employment, to a state of non-participation in the labour force, would have a lower likelihood of experiencing LTU.

5.1.4 Analysis by Ethnicity

The results in Table 5.1 for both Maori and Pacific Islanders were *a priori* expected indicating these groups have a higher probability of experiencing LTU than NZ European and "Other". These adverse results could reflect the real or perceived disadvantages faced by both Maori and Pacific Islanders. Both Maori and Pacific Islanders have relatively lower educational qualifications than NZ European and "Other". They tend to be employed in low-skill, low-paid jobs, in regions or industries (like manufacturing), where there are relatively few job opportunities. Finally, they tend to be limited in their mobility (Monitoring and Evaluation Branch, 1999, Market Research and Evaluation Team, 1996). Chapple (2000, p. 12) indicated that Maori may lack information and the necessary networks needed to attain a job that non-Maori may possess. Also of importance is the geographical location factor, i.e., Maori are located in areas with relatively high rates of unemployment and poor employment prospects. Maori are considered relatively immobile - a possible cause for this being a strong attachment to their iwi (Vaitianathan 1995, cited in Mare, 1995, p. 118).[1]

[1] Iwi refers to tribe for Maori job seekers.

Comparing the odds for Maori and NZ European/Pakeha for the 1988-97 period, the percentage odds of LTU were about 21% higher for Sole Maori, and 8% higher for Mixed Maori, in relation to New Zealand European/Pakeha. The reason for this difference in results for Maori is:

> "There is considerable evidence that mixed Maori have socio-economic outcomes that are more like non-Maori than they are to those of sole Maori. Indeed, socio-economic differences between mixed Maori and non-Maori are frequently statistically insignificant" (Chapple 2000, p. 6).

Pacific Islanders were about 9% more likely than New Zealand European/Pakeha to experience LTU. As mentioned previously, educational attainment is lower for Pacific Islanders than New Zealand European/Pakeha and Other Ethnicity, but similar to Maori. The reasons why educational attainment is relatively poor, however, may not be similar for both groups. Poor English language skills and poor literacy skills have been reported as key problems for Pacific Islanders. Krishnan et al. (1994, p .58) noted that:

> "Even among those Pacific Island workers who had post-school qualifications, the unemployment rates were more than double that of the total labour force. This seems to suggest the Pacific Island people have been particularly vulnerable to changes in the relative size of different sectors within the economy".

Fletcher (1995b, pp. 126-127) also noted that the geographic distribution of the Pacific Island population was centred in urban areas with a majority in Auckland and Wellington. These are usually areas recognised for greater job opportunities relative to the rural regions' poor job opportunities. The Employment centres in these two cities accounted for 80 % of the registered Pacific Island unemployment at that time. With Pacific Island job seekers being more likely to accept low-paying jobs, there are indications that Pacific Island job seekers move to these jobs. Also, these jobs are usually in industries where new job opportunities may be few (Market Research and Evaluation Team, 1996).

Finally, the important issue was raised that the Pacific Island ethnic classification itself should be divided into two categories.

> "While there is considerable variation between the experiences of Pacific Island people from different ethnic groups perhaps the greatest differences lie between migrant and New Zealand-born Pacific Islanders. New Zealand-born Pacific Islanders are more likely to have formal educational qualifications, including post-school qualifications. They are also more likely to be employed in 'professional' qualifications. These differences reveal a complex labour market amongst the Pacific Island population" (Krishnan et al. 1994, p. 68).

New Zealand European/Pakeha were 12% more likely than those identified as "Other" to experience LTU. Hence, "Other" job seekers have the lowest likelihood of all groups to experience LTU. These results seem contrary to statistics in Appendix A, Table A.2 where "Other" job seekers have higher unemployment rates than NZEP but also a high proportion of their unemployed are long-term unemployed (see Table 2.3A). However, the following key findings from a survey reported by the Market Research and Evaluation Team (1996) supports the results that have been obtained from the sample by the model:

i. "Other" job seekers were more willing to accept low-paid jobs than were NZ European/Pakeha or Maori;
ii. "Other" job seekers were geographically concentrated in urban areas, where there are greater economic opportunities;
iii. "Other" job seekers were very mobile compared to other ethnic groups; and
iv. A high proportion of "Other" job seekers possesses school or tertiary level qualifications.

5.1.5 Analysis by Education

The results for education variables for the 1988-97 period confirm expectations that higher levels of education can reduce the possibility of unemployment and also LTU. An individual job seeker with no formal education or less than three years secondary

schooling was 33% more likely to experience LTU than the base category (Degree or professional qualification). However, a job seeker who had less than three School Certificate passes or equivalent more than halves this likelihood (to approximately 14 %) but was still more likely to become long-term unemployed. With each increase in the level of education, the percentage odds of being long-term unemployed decreases (with the exception of job seekers with three or more School Certificate passes or equivalent). The results therefore indicate what is widely known – the more qualifications a person attains, the lower the probability of unemployment and LTU.

Traditionally, Maori and Pacific Island job seekers possess either no formal education or lower forms of qualifications, and substantial proportions of these people report literacy and mathematics problems. Also, the rates for those who do have high qualifications are lower than rates for New Zealand European/Pakeha and "Other". "Other" job seekers, as mentioned previously, usually have school or tertiary qualifications, but, like Pacific Islanders, have problems with English skills.

5.1.6 Analysis by Regional Location of Office

The results for three regions – East Coast, Canterbury and Central – indicated those registering in offices in these regions would have the same likelihood of being long-term unemployed as those registered in Wellington for the 1988-97 period. Wellington had higher percentage odds of LTU than the remaining regions. According to the estimates, those who register for unemployment in Nelson would have the lowest percentage odds of being long-term unemployed in New Zealand. This is consistent with statistics discussed in the first chapter, i.e. Nelson has the lowest current unemployment rate in New Zealand.

Shirley et al. (1990, p. 131) raised an important issue concerning LTU in New Zealand:

> "It is not difficult to draw a core/periphery model of unemployment in New Zealand in which regions on the economic periphery, disconnected from metropolitan New Zealand, are likely to experience the highest

> unemployment. In the periphery there are proportionally more Maori and the labour force tends to have poorer skills and fewer opportunities to acquire them".

Therefore, job seekers registering in the Bay of Plenty were assumed to be in a region with relatively high LTU. This was based on the region being a rural area with very low economic growth, the second highest regional unemployment rate in New Zealand, and a high percentage of the population derived of Maori ethnicity. These were some factors that Shirley et al. identified as being some key factors for LTU. However, the results from the data indicates those registering in Bay of Plenty would rank third in terms of being least likely to experience LTU behind job seekers registering in Nelson and Central. This is probably attributed to the high proportion of seasonal work in the region. If the unemployment is seasonal, the unemployment spell is usually of relatively short duration. Looking at urban areas (Auckland, Wellington and Canterbury), Wellington and Canterbury registrants have the same likelihood of being long-term unemployed.[2] Registrants in both regions are 15% more likely than registrants in Auckland of being long-term unemployed. This is attributed to the large number of part-time and temporary jobs that are available in the Auckland region, while a relatively large proportion of job seekers coming from rural areas disadvantages Canterbury.

Overall, the results of the percentage change in odds of being long-term unemployed under the LTU27 model have illustrated *a priori* expected results both for the total period and generally for the various individual years. However, with the large proportion of coefficients being statistically insignificant at the 10% level, and the low R-square statistics, could these factors adversely affect the predictive performance of the model?

[2] This analysis is not a true analysis of urban regions as Canterbury includes a large rural region, while Auckland is made up of three different regions.

5.2 Analysis of LTU52 model results

In comparison to the results obtained from the LTU27 model regressions, the LTU52 model results were relatively similar. Appendix C, Tables C.2A and C.2B, present the regression results for the model. For the various years many of the coefficients were found to be statistically insignificant at the 10% level like the LTU27 coefficients. However, for the model covering the whole period, only the Northland coefficient was found to be statistically insignificant at the 10% level. The chi-square values for the likelihood ratio test were higher than the critical values indicating the coefficients were not equal to zero. However, the various R-squared statistics were low, like for the LTU27 models. Thus the R-square statistics could indicate the model may make a poor fit of the data. Also of significance is the advent of no long-term unemployment present in 1997 from the sample. The maximum duration in the sample was 51 weeks so therefore the model could not be applied to the data for that year as no results would be obtained.

5.2.1 Another example of LTU profiling

Like the previous section, to estimate the percentage odds that a given individual would be long-term unemployed, the estimated coefficients for the relevant dummy variables, and the age of the individual are substituted into equation (4.8) from Chapter 4. Using the same example used in the previous section, the coefficients from Appendix C, Table C.2B are used:

$$L_i = -2.12168 - 0.35588 + 0.14238 + 0.34793 - 0.06614 + 0.01071(35)$$
$$= -1.67854$$

$$P_i = \text{antilog } L_i / (1 + \text{antilog } L_i)$$
$$= 0.18665 / 1.18665 = 0.1573$$

Based on this example, this individual has about a 16% chance of being long-term unemployed. The percentage odds of being long-term unemployed under LTU52 are

presented in Table 5.2. Since the results are comparatively similar, and would therefore follow the same explanations given in the previous section for LTU27, only summary key points of the results will be discussed.

TABLE 5.2: PERCENTAGE CHANGES IN THE ODDS OF AN INDIVIDUAL BEING LONG-TERM UNEMPLOYED - LTU52

Variable	Year or Period										
	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1988-1997
Age	0.00	2.00	1.21	1.29	1.01	1.03	1.34	0.49	0.74	0.00	0.00
Gender											
Male	#	#	#	#	#	#	#	#	#	#	#
Female	-28.70	-28.96	-37.75	-37.33	-26.54	-32.24	-29.94	-31.52	-33.14	0.00	-34.77
Ethnic Group											
NZ European	#	#	#	#	#	#	#	#	#	#	#
Sole Maori	3.81	-2.08	54.12	63.98	35.42	44.29	71.25	38.50	13.30	0.00	34.65
Mixed Maori	-16.61	1.05	21.97	13.86	26.08	31.53	22.97	17.62	18.49	0.00	12.56
Pacific Island	-6.37	-2.42	32.55	43.30	29.64	44.51	40.44	-5.81	-1.58	0.00	15.30
Other	18.45	0.00	19.46	6.74	1.13	-8.24	14.21	8.31	-19.52	0.00	-18.34
Qualification											
Degree or professional qualification	#	#	#	#	#	#	#	#	#	#	#
Less than 3 years secondary school/ No formal school	6.36	32.25	77.03	57.82	50.55	67.79	64.94	18.87	54.25	0.00	70.62
Less than 3 School Cert. passes.	-46.86	-4.78	63.33	45.61	23.40	37.91	62.54	-4.50	22.86	0.00	41.61
Three or more School Cert. Passes.	0.00	0.00	23.03	23.76	9.42	17.69	26.45	-15.34	21.42	0.00	0.00
6th Form Cert., UE, Bursary, HSC.	-42.93	-10.83	6.54	-0.56	13.30	25.10	31.04	-4.30	18.51	0.00	16.11
Post Secondary/ Trade qualification	-6.04	15.15	27.29	-1.24	11.75	8.84	14.19	-11.16	-10.02	0.00	18.26
Other school qualification	-53.48	30.16	14.54	17.09	27.98	36.46	10.35	33.41	14.52	0.00	17.00
Regional Office											
Wellington	#	#	#	#	#	#	#	#	#	#	#
East Coast	0.00	-24.71	-32.88	-43.90	-26.24	-47.57	-37.78	-24.48	-47.29	0.00	0.00
Auckland	71.30	16.75	0.00	-10.96	-5.91	-20.41	-29.04	10.87	-19.39	0.00	-6.40
Canterbury	0.00	0.00	17.92	-12.63	-3.47	-20.51	-18.10	-14.46	-28.64	0.00	0.00
Nelson	-22.68	-49.80	-25.24	-34.64	-25.02	-46.00	-67.34	-3.50	-35.38	0.00	-36.75
Waikato	-15.71	-36.97	15.59	-5.38	-17.18	-27.30	-17.70	21.59	-35.00	0.00	-13.88
Central	0.00	-22.18	-17.90	-16.65	-14.74	-24.89	-24.79	-9.26	-39.73	0.00	0.00
Northland	39.97	3.26	24.60	7.24	23.09	17.97	4.10	23.56	-29.81	0.00	7.86
Southern	-32.63	0.00	-9.16	-27.19	-20.79	-43.14	-37.28	-11.66	-37.42	0.00	-31.57
Bay of Plenty	-24.27	-15.70	0.49	-5.68	-11.36	-15.86	-21.32	-20.90	-45.49	0.00	-17.71
Taranaki	19.93	-16.85	28.06	-13.06	-11.59	-20.74	-34.06	18.90	-15.70	0.00	-12.84
Intercept											
Constant	-85.61	0.00	-89.94	-81.89	-85.16	-87.15	-91.51	-88.06	-91.61	0.00	-88.02

5.2.2 Discussion of LTU52 estimates

The age variable results ranged between 0%-2% over the various years. Since they were non-decreasing, they indicate that older job seekers will have slightly higher percentage odds of being long-term unemployed than younger job seekers. However, for the period as a whole, age was not considered a factor of difference.

Males were more likely to experience LTU than females by between 27% and 38% for the various years and by 35% for the 1988-1997 period. The explanation given for this occurrence in the labour market is that females are more likely to move immediately from a state of employment to non-participation in the labour market. These results support the results obtained for the LTU27 model.

Due to the large number of coefficients being statistically insignificant at the 10% level, the results obtained for the period are discussed for the following variables. Under the LTU52 definition the Maori and Pacific Island job seekers remain relatively disadvantaged to NZ European/Pakeha and 'Other'. Sole Maori remains the most disadvantaged ethnic group, 35% higher odds of being long-term unemployed than NZ European / Pakeha. Pacific Islanders rank second in terms of disadvantage, about 15% higher, while Mixed Maori are 13% higher than NZ European / Pakeha. Only the 'Other' ethnic group has lower odds than NZ European / Pakeha, the base group having an 18% higher chance of being long-term unemployed. This reinforces the previous results obtained for the LTU27 model and clearly indicates that even though a large proportion of 'Other' job seekers are long-term unemployed (see Tables 2.3A and 2.3B), they are considered the least disadvantaged ethnic group.

The educational variables provide the strongest indications of how a poor education can lead to LTU. Job seekers with no formal education or less than three years schooling were found to be 71 % more likely to be long-term unemployed than job seekers with a degree or professional qualification. Job seekers with less than three School Certificate passes or equivalent were 42% more likely to become long-term unemployed, while those with an either Sixth Form Certificate, University Entrance, Bursary or Higher

School Certificate had 16% higher chance of being long-term unemployed than degree holders. However, qualifications of post secondary, trade school or other nature were found to be at a higher risk level (18% and 17% respectively). Hence, results support early findings that by investing in education, the chances of finding a job improves and chances of becoming unemployed and long-term unemployed reduces. However, the results also indicate that the job market prefers higher secondary qualifications (like HSC6) to some forms of post secondary qualification (like PSTR and OTHS).

Individual job seekers registering in the East Coast, Canterbury and Central regions would find they would face the same likelihood of LTU as job seekers registering in Wellington. Nelson registrants had relatively the lowest chance of being long-term unemployed of all regions, Wellington registrants being about 37% more likely of being long-term unemployed than those in Nelson are. Southern registrants would rank second least disadvantaged - Wellington job seekers had a 32% higher chance of being long-term unemployed. Of the urban regions, Auckland registrants would be less disadvantaged of becoming long-term unemployed compared to registrants from Wellington and Canterbury.

5.3 A comparison of LTU27 and LTU52 results

Overall, the results of the percentage change in odds of being long-term unemployed under the LTU52 model are higher for all categories than odds for the LTU27 model. This indicates that by lengthening the period of unemployment duration, sharper results are obtained.

The results for sections 5.1 and 5.2 are consistent with results obtained by Obben et al. (2001; and forthcoming), for age, gender and ethnicity. However, results obtained from section 5.1 and 5.2 for education and regional analysis are different for some variables. For example, under this study, registrants from East Coast, Canterbury and Central had comparable percentage odds of LTU as registrants from Wellington. The Obben et al. (2001; and forthcoming) study registrants from Auckland North, Central and Taranaki

had comparable percentage odds of LTU as registrants from Wellington. The main differences in the results for education and regional variables can be attributed to:

1. The different definition of variables; for example, in this study, one variable is used for Auckland rather than three separate variables as in the Obben et al. studies;
2. The definition of LTU in this study is 27 weeks or longer as opposed to 26 weeks or longer used under the Obben et al. studies; and
3. The definition of a few education variables differs from the Obben et al. studies. For example, this study uses 'Post secondary and trade qualifications' which are not present in the Obben et al. studies. However, Obben et al uses the 'A levels' variable, which is not present in this study.

The results of this study were *a priori* expected, both for the period and generally for the various years. However, with the large number of statistically insignificant results, this could be indicative of the poor results obtained for the fit of the model to the data (from the R-square statistics). This also raises the question, if this model was utilised, how accurate would the model be in predicting whether a job seeker would be long-term unemployed or not? To answer this question we interpret the predictive statistics obtained from the regressions of the models.

5.4 Predictive performance of the empirical models

Using SHAZAM, we are able to compute the predictive performance of the model using two different methods. The first method involves using the following decision rule: to predict $Y_t = 0$ (STU) when the estimated probability of observation i ($\hat{P}_i$) is less than 0.5; and to predict $Y_t = 1$ (LTU) when $\hat{P}_i \geq 0.5$. The predictive results indicate the count of LTU using this decision rule (White 1997, p. 282). When this rule is used the number of cases predicted as either LTU or STU may or may not be equal to the actual number of LTU or STU cases in the sample. Also, the predicted cases of LTU may not be actual LTU cases.

In the second method, however, the number of cases predicted as either LTU or STU are constrained to equal the actual number of LTU (STU) cases in the sample (Hensher and Johnson, 1981, pp. 53-55). The results of this second method were reported as the Hensher-Johnson prediction success table in the SHAZAM printout. Despite this constraint, not all cases predicted as LTU may actually be LTU cases like the 'unconstrained' prediction method. The corresponding success rate can be calculated from the proportion of correctly predicted LTU cases. Hence, the predictions for the first and second methods are identified as 'unconstrained' and 'constrained' predictions, respectively. The results for these two methods of prediction for the LTU27 model are summarised in Table 5.3 and for the LTU52 model in Table 5.4.

TABLE 5.3: PREDICTIVE PERFORMANCE OF THE LTU27 MODEL FOR INDIVIDUAL YEARS AND PERIOD 1988-1997

LTU definition	No. of LTU cases in sample	Unconstrained Predictions of LTU Cases Only			Success Rates in Constrained Predictions		
		No. predicted	Correct predictions	Success rate	LTU	STU	Overall
1988	670 (42%)	409 (61%)	233 (57%)	35%	46%	61%	54%
1989	3217 (41%)	1066 (33%)	580 (54%)	18%	43%	60%	53%
1990	4368 (38%)	566 (13%)	299 (53%)	7%	40%	62%	54%
1991	5239 (45%)	3199 (61%)	1776 (56%)	34%	47%	56%	52%
1992	4835 (41%)	1101 (23%)	590 (54%)	12%	42%	60%	52%
1993	4347 (38%)	405 (9%)	214 (53%)	5%	39%	63%	54%
1994	3530 (33%)	44 (1%)	19 (43%)	0%	34%	68%	57%
1995	3416 (32%)	0 (0%)	0 (0%)	0%	33%	68%	57%
1996	3009 (29%)	0 (0%)	0 (0%)	0%	30%	71%	59%
1997	456 (11%)	0 (0%)	0 (0%)	0%	11%	89%	81%
1988-97	33087 (36%)	383 (1%)	173 (45%)	0%	37%	65%	55%

TABLE 5.4: PREDICTIVE PERFORMANCE OF THE LTU52 MODEL FOR INDIVIDUAL YEARS AND PERIOD 1988-1997

LTU definition	No. of LTU cases in sample	Unconstrained Predictions of LTU Cases Only			Success Rates in Constrained Predictions		
		No. predicted	Correct predictions	Success rate	LTU	STU	Overall
1988	397 (25%)	79 (20%)	48 (61%)	12%	31%	77%	66%
1989	1805 (23%)	11 (0%)	6 (55%)	0%	26%	78%	66%
1990	2017 (18%)	0 (0%)	0 (0%)	0%	20%	83%	72%
1991	2633 (23%)	5 (0%)	3 (60%)	0%	25%	78%	66%
1992	2151 (18%)	0 (0%)	0 (0%)	0%	20%	82%	71%
1993	1787 (15%)	0(0%)	0 (0%)	0%	17%	85%	75%
1994	1318 (12%)	0 (0%)	0 (0%)	0%	14%	88%	79%
1995	1243 (12%)	0 (0%)	0 (0%)	0%	13%	88%	80%
1996	813 (8%)	0 (0%)	0 (0%)	0%	9%	92%	86%
1997	0 (0%)	0 (0%)	0 (0%)	0%	0%	0%	0%
1988-97	14164 (15%)	0 (0%)	0 (0%)	0%	17%	85%	74%

Note: Since there were no LTU cases in the 1997 sample, there were no regression results and therefore, no predictions could be estimated.

5.4.1 Unconstrained Prediction Results

The first column of results provides the proportion of the sample that was indicated as LTU in the actual results. The next three columns of results focus on the unconstrained method of prediction. These results indicate the logit model performed poorly for both LTU27 and LTU52 in identifying long-term unemployed as the predicted number of cases were consistently smaller than the actual number of LTU cases from the sample. For the LTU27 model, the number of LTU cases predicted ranged from 0% to 61% on a yearly basis, and only 1% of the actual LTU count for the 1988-1997 period. Also of note is that for the years 1995, 1996 and 1997, not a single case of LTU could be predicted for the LTU27 model even though LTU was present in the sample. The results for the LTU52 model was relatively worse as most of the yearly results could not indicate a single case of LTU and when LTU cases were present they could range between 0% and 20% of the actual count. Hence, it may seem that the logit model is incapable of predicting any LTU at all, in certain cases. Also, among the cases selected as LTU, not all of them were actually LTU cases. Of the number of LTU cases predicted throughout the yearly and period analysis for both LTU models, the proportion of successfully

predicted long-term unemployed was about 50%. Hence, a feasible conclusion would be that if any LTU predictions were present, only half of them would be genuine long-term unemployed cases while the other half would be short-term unemployed incorrectly identified as LTU cases. When the successfully predicted LTU cases are expressed as proportions of the known cases in the original data, their values range from 0% to 35% for the various years and 0% for the 1988-1997 period for the LTU27 model. The LTU52 results were less successful – 1988 had 12% success while the remaining years and the period had 0% success. The results of the unconstrained method of prediction indicates that the personal characteristics of unemployed collected by the NZES at the time of registration may not be adequate for identifying long-term unemployed. However, the constrained method may prove more enlightening.

5.4.2 Constrained Prediction Results

The prediction success for the constrained model is presented in the last three columns of the tables. The constrained model seems to maintain the proportionality of LTU cases in the original sample to the LTU predictions. Thus, the success rate of the LTU predictions is directly related to the proportion of LTU cases in the sample. For instance, the proportions of LTU in the LTU27 and LTU52 models for the whole period were 36% and 15% respectively, while the success rates for correct predictions of LTU were 37% and 17% respectively. The effect of the weighting is also true for STU. The margin of difference for the correctly predicted LTU to actual proportion of LTU was between –2% to +6%. The combined rate of success for selecting LTU and STU cases for the constrained method varied from 52% to 81% over the various years and the 1988-1997 period for LTU27. Under LTU52 this success rate varied between 66% and 86% for the various years and period. However, this success rate is biased due to stronger weighting given to STU, as there is a larger proportion of STU in the samples. Also, the correct prediction of LTU under both models never attains a 50% success identification level. Therefore, a large proportion of job seekers that would have been identified as long-term unemployed would in fact be short-term unemployed. Hence, the results under the constrained method of prediction also support the previous statement concerning the

unconstrained model results. The NZES needs to collect more information - either more personal attributes of the unemployed and/or other data from the labour market – to identify job seekers who may become long-term unemployed.

5.5 Concluding Comments

The results obtained from the logit models LTU27 and LTU52 revealed regression coefficients and percentage changes in odds that were *a priori* expected or at least could be explained. The explanatory power of the models was low, with relatively low R-squared statistics. The predictive power of the model was also low which lends support to the conclusion from other studies that have used different approaches to LTU estimation that additional data needs to be collected. The additional information that would be required is discussed in the next chapter.

CHAPTER SIX

Conclusions and Recommendations

6.0 Introduction

This study has set out to identify the percentage change in odds of individual job seekers registering as unemployed to profile whether they will become long-term unemployed or not. To achieve this profile of the job seeker, the personal attributes of the job seeker are applied in a model to see the probability of the job seeker becoming long-term unemployed. Employing a binary model using a logistic cumulative distribution function, the estimated coefficients of the explanatory variables are obtained by using the maximum log-likelihood procedure. Previous empirical studies using binary or survival approaches to profiling job seekers for LTU have failed in terms of lacking explanatory power through low R-squared values and inadequate prediction success. The following section summarises the results of this study.

6.1 Summary of Results

Using two logit models that employ different definitions of LTU – LTU27 for unemployment spells that are 27 weeks or longer and LTU52 for unemployment spells 52 weeks or longer – coefficients for the explanatory variables were estimated. The R-square values for the yearly and period results were relatively low. For the yearly analysis from 1988-1997, many of the estimated coefficients for both the LTU27 and LTU52 models were found to be statistically insignificant at the 10% level. The Northland variable was found to be statistically insignificant at the 10 % level for both the LTU models covering the period 1988-1997. Under the LTU27 model for the period 1988-1997, education above the Sixth Form level was also found to be statistically insignificant at the 10% level. Both the low R-square values and the large number of statistically insignificant estimated coefficients indicate the model has inadequate explanatory power.

The actual estimated coefficients for the LTU models confirmed *a priori* expectations. Males have higher percentage odds of being long-term unemployed than females. Maori and Pacific Islanders are identified as high risk groups for LTU while NZ European/Pakeha had higher percentage odds of being long-term unemployed than 'Other' job seekers. By attaining qualifications, the chances of a job seeker becoming long-term unemployed are reduced. The higher the level of education received by the job seeker, the lower the odds of being long-term unemployed. However, the results also indicate the 'quality' of the educational qualifications received by a job seeker may be considered important. Under LTU52, job seekers with post secondary, trade or other school qualifications had relatively higher percentage odds of being long-term unemployed than job seekers with Sixth Form Certificate, University Entrance, Bursary or Higher School Certificate. This could indicate employers prefer hiring job seekers with secondary or tertiary rather than hiring job seekers with other qualifications.

The regional analysis indicated job seekers registered in East Coast, Canterbury and Central regions had relatively the same percentage odds of being long-term unemployed as job seekers registered in Wellington. The remaining job seekers registered in other regions had lower percentage odds of LTU than job seekers in Wellington. The data in this sample did not contain specialised urban data, but there was a look at urban areas (Auckland, Wellington and Canterbury). Job seekers registered in Auckland had lower percentage odds of LTU than job seekers registered in Wellington and Canterbury. However, job seekers in Wellington and Canterbury had the same percentage odds of being long-term unemployed. As a suggestion of improving this urban analysis, specialised data concerning rural and urban registration of job seekers would help enhance the explanatory power of the model and should improve profiling of job seekers. Hence, although the results are consistent with *a priori* expectations, they must be treated with caution.

The predictive power of the LTU models proved to be poor. The number of cases predicted as long-term unemployed were consistently less than 50% of the actual number

of long-term unemployed under the constrained and unconstrained prediction methods. Also, in certain years, no LTU cases were predicted unless the predictions were forced to be equivalent to the proportion of actual LTU cases (as seen under the constrained predictions). This meant if the profile of the model was applied to actual individuals at the time of registration, more often than not, they would be identified as short-term unemployed, even though they may become long-term unemployed. Hence, the job seeker would not receive the necessary assistance when they need it. Also, of the number of job seekers predicted as long-term unemployed, approximately half of them would be correctly identified as long-term unemployed. This tends to suggest a considerable waste of resources, which would not be acceptable to the taxpayers and the government. Therefore, to improve the predictions of identifying long-term unemployed, the LTU profiling model would need to be improved.

Finally, comparing the LTU27 and LTU52 models, the percentage change in odds of being long-term unemployed under the LTU52 model are larger in absolute value for all categories than odds for the LTU27 model. This indicates that by lengthening the period of unemployment duration, sharper results are obtained. However, by lengthening the period of unemployment duration, the predictive performance of the model is reduced. This results in decreased success rates in correctly identifying long-term unemployed under both the constrained and unconstrained predictive methods.

6.3 Recommendations

There is a need to collect more information about the individual job seeker to help improve the profiling models accuracy. Additional job seeker attributes, such as the income earned from previous jobs, marital status, and the number of dependents, have been identified as helping explain the job seeker profile as well as information concerning the local conditions of the labour market (Gardiner, 1995, p.74; Watson et al., 1997, p.59; OECD, 1998, pp. 13-14). Also, the theories concerning unemployment duration that was mentioned in Chapter 3 may suggest additional job seeker attributes. Especially information concerning the minimum-asking wage would determine whether

the job seeker might be pricing himself/herself out of employment opportunities. The integration of the NZES and WINZ databases may also create a longer and larger sample to investigate the LTU problem. Finally, a selection process, which results in a minimum of 10,000 observations for each year, may produce results that may have better explanatory power (i.e., higher R-squared values and more statistically significant estimated coefficients). Also, the additional information could improve the predictive power of the models.

APPENDIX A - LABOUR FORCE PARTICIPATION AND UNEMPLOYMENT RATES

TABLE A.1A LABOUR FORCE PARTICIPATION RATES BY AGE GROUP

Average for Year ended March	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65+
1987	63.2	83.0	77.6	79.2	84.5	88.3	85.3	77.8	65.6	32.7	8.7
1988	63.3	82.3	78.2	78.6	83.8	87.8	85.1	79.3	65.6	30.1	8.0
1989	59.2	78.8	77.5	77.8	82.8	86.8	84.7	80.2	64.2	26.1	7.0
1990	56.1	79.0	77.0	77.2	82.4	86.2	85.2	79.9	62.7	24.4	6.7
1991	57.5	79.2	77.3	77.5	83.3	86.4	85.6	79.6	61.9	25.7	6.6
1992	54.4	79.1	76..7	78.3	83.3	86.6	85.6	79.3	64.1	24.6	6.0
1993	50.4	78.7	77.7	78.0	82.8	86.0	87.2	77.1	65.0	25.1	5.3
1994	50.6	78.6	78.8	77.4	81.7	85.3	86.1	79.6	64.4	31.1	5.6
1995	52.9	78.4	79.2	78.2	80.3	85.2	86.1	80.8	66.1	33.6	6.1
1996	56.2	78.6	80.0	77.9	82.0	84.2	86.3	82.0	67.2	36.8	6.0
1997	56.3	78.0	80.1	78.4	82.8	84.7	86.7	82.5	69.4	40.7	6.7
1998	56.0	77.9	79.6	78.3	82.2	84.4	86.4	82.7	68.8	41.9	6.1
1999	52.8	76.5	79.6	77.2	81.3	84.2	86.2	83.1	70.8	44.9	6.3

TABLE A.1B UNEMPLOYMENT RATES BY AGE GROUP

Average for Year ended	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65+
1987	11.3	4.8	4.5	3.4	2.4	2.1	1.8	2.2	1.9	..	..
1988	10.7	6.6	4.6	3.8	2.8	2.0	2.0	2.3	2.1	..	..
1989	14.1	9.8	6.2	5.6	4.8	3.5	3.0	3.6	3.5	..	..
1990	15.9	11.3	7.9	6.4	4.8	3.8	4.0	5.0	4.5	..	..
1991	18.4	12.8	9.0	8.1	6.1	5.2	4.7	5.5	5.7	3.1	..
1992	22.1	17.5	12.1	9.9	7.6	6.5	6.5	6.7	6.8	..	..
1993	22.2	15.5	11.1	9.9	8.1	6.3	5.8	7.1	7.9	2.9	..
1994	21.5	14.0	10.2	8.5	7.4	6.5	5.5	7.3	6.8	2.5	..
1995	17.6	11.3	8.1	6.6	6.6	5.1	4.7	5.3	4.8	3.0	..
1996	16.2	9.0	5.8	5.1	5.3	5.0	4.3	3.5	3.5	2.7	..
1997	15.8	9.0	6.5	5.7	4.7	4.6	4.1	4.1	4.2	3.1	..
1998	16.4	11.8	6.5	6.7	5.3	5.1	4.5	3.8	4.5	2.9	..
1999	17.5	12.3	7.8	6.9	6.4	5.6	5.0	4.8	5.3	4.1	..

Source: Household Labour Force Survey (Statistics New Zealand, 2000, Labour Market Statistics 1999, Table 3.2, pp. 35-39).

TABLE A.2: LABOUR FORCE PARTICIPATION RATES AND UNEMPLOYMENT RATES BY ETHNICITY

Average for Year ended March	New Zealand European / Pakeha		Maori		Pacific Islands [1]		Other [1]	
	LFPR	UR	LFPR	UR	LFPR	UR	LFPR	UR
1987	65.9	3.2	66.9	10.8	70.0	6.1	67.9	3.1
1988	65.8	3.5	64.2	10.9	69.4	8.3	68.6	4.1
1989	64.4	4.9	60.6	14.8	64.2	14.8	69.5	7.6
1990	63.8	5.6	58.9	18.1	63.3	18.3	68.0	8.4
1991	64.3	6.5	59.7	21.1	62.2	22.7	65.0	10.5
1992	64.1	8.1	60.0	25.8	61.4	28.8	63.7	14.4
1993	63.7	7.9	59.3	24.4	60.6	25.1	62.9	14.4
1994	64.3	7.1	58.8	22.8	60.7	24.2	63.2	12.8
1995	65.2	5.5	59.9	19.4	60.3	20.6	59.7	10.6
1996	66.2	4.6	61.0	15.4	58.9	15.2	58.6	11.1
1997	67.2	4.6	61.1	15.4	60.2	14.9	56.3	11.4
1998	66.7	4.8	62.5	17.3	63.0	15.1	56.8	13.3
1999	66.6	5.5	61.8	18.6	61.6	14.8	54.7	13.3

Notes

(1) The introduction of a new standard classification of ethnic groups in the December 1991 quarter led to a discontinuity in the "Pacific Islands" and "Other" series. A new category, "other Pacific Islands", was added to the Pacifc Islands group, increasing the number of people classified to this group and reducing the number classified to the "Other" ethnic group. Those people who did not specify their ethnic status are included in the totals.

Source: Household Labour Force Survey (Statisitcs New Zealand, 2000, Labour Market Statistics 1999, Table 3.7, pp. 56-57.).

TABLE A.3: LABOUR FORCE PARTICIPATION RATES AND UNEMPLOYMENT RATES BY EDUCATIONAL ATTAINMENT

Average for Year ended March	No Qualifications		School Qualifications		Post School But No School Qualifications		Post School and School Qualifications	
	LFPR	UR	LFPR	UR	LFPR	UR	LFPR	UR
1987	57.3	6.1	65.7	3.8	77.2	2.5	78.6	2.0
1988	56.5	6.3	65.6	4.4	75.4	3.1	78.5	2.2
1989	53.5	9.6	64.2	6.2	72.2	4.8	78.1	2.8
1990	51.4	11.1	63.6	7.0	72.2	6.2	78.4	3.6
1991	52.2	12.7	60.8	8.5	74.1	7.8	77.7	5.1
1992	52.0	16.1	59.1	10.5	75.0	10.8	78.0	6.5
1993	51.2	15.8	58.1	9.7	73.4	10.3	78.9	6.4
1994	49.8	14.9	59.8	9.0	73.9	10.2	79.4	5.5
1995	49.9	12.3	60.7	7.3	73.1	8.3	79.3	4.3
1996	49.4	10.7	62.4	5.7	73.0	6.5	79.7	3.8
1997	49.7	10.6	63.6	6.0	72.7	6.8	80.3	3.7
1998	48.5	11.7	63.7	6.6	71.6	7.6	79.9	4.3
1999	48.7	12.6	62.7	7.1	70.1	8.6	79.2	4.9

Source: Household Labour Force Survey (Statistics New Zealand, 2000, Labour Market Statistics 1999, Table 3.6, pp. 51-52.).

TABLE A.4A: LABOUR FORCE PARTICIPATION RATES BY REGIONAL COUNCIL

Average for Year ended March	Northland	Auckland	Waikato	Bay of Plenty	Gisborne/ Hawke's Bay	Taranaki/ Manawatu-Wanganui [1]	Wellington	Tasman/ Nelson-Marlborough/ West Coast[2]	Canterbury	Otago/ Southland [1]	Total all Regional Councils
	(%)										
1991	60.6	66.3	65.9	61.7	58.0	61.5	67.3	63.1	62.7	60.1	63.9
1992	62.9	65.1	64.8	61.4	58.5	60.8	66.3	65.9	62.5	62.7	63.6
1993	62.3	64.1	62.9	60.4	61.2	61.2	66.9	63.4	62.8	61.5	63.2
1994	64.5	64.7	63.1	59.9	62.0	59.3	67.3	63.0	64.2	62.9	63.6
1995	61.2	65.4	63.6	62.2	63.6	61.3	66.7	66.3	63.5	64.2	64.3
1996	61.4	67.2	65.3	61.0	62.3	62.4	67.6	66.8	64.0	64.5	65.1
1997	60.8	68.1	65.0	62.1	63.0	61.8	69.1	66.6	65.5	64.4	65.8
1998	59.6	68.6	63.4	62.9	60.5	61.6	69.2	68.9	64.0	63.9	65.6
1999	58.7	67.1	62.8	64.0	60.2	61.3	68.3	68.8	64.2	66.4	65.2

TABLE A.4B: UNEMPLOYMENT RATES BY REGIONAL COUNCIL

Average for Year ended March	Northland	Auckland	Waikato	Bay of Plenty	Gisborne/ Hawke's Bay	Taranaki/ Manawatu-Wanganui [1]	Wellington	Tasman/ Nelson-Marlborough/ West Coast[2]	Canterbury	Otago/ Southland [2]	Total all Regional Councils
	(%)										
1991	10.6	8.3	8.8	9.7	10.2	9.3	7.2	8.6	7.9	7.3	8.4
1992	13.5	11.9	10.9	12.1	10.3	11.9	8.6	8.4	9.3	8.5	10.6
1993	11.1	11.0	10.6	12.4	10.4	11.3	9.3	7.4	9.1	7.9	10.1
1994	13.8	9.7	9.8	10.9	11.0	9.6	9.0	8.9	7.6	6.9	9.3
1995	13.1	7.0	8.1	9.6	8.5	7.9	7.9	6.6	6.4	5.9	7.5
1996	10.2	5.3	6.7	8.2	6.7	7.1	6.7	4.5	5.9	5.0	6.2
1997	8.4	5.5	6.9	8.2	7.9	6.5	5.9	6.0	6.2	4.8	6.2
1998	10.0	7.1	7.0	8.7	8.5	6.2	5.4	5.2	6.7	5.8	6.8
1999	11.6	6.9	8.5	11.4	8.1	6.8	6.1	6.1	7.7	7.0	7.5

Notes

(1) Separate estimates for Taranaki and Manawatu-Wanganui, as well as Otago and Southland are available from the September 1994 quarter onwards.

(2) This combined regional council area has been renamed. The name used previously was Nelson/Marlborough/West Coast. The new name reflects the current regional council area. Associated boundary changes are negligible and do not result in loss of continuity in the same series.

Source: Household Labour Force Survey (Statistics New Zealand, 2000, Labour Market Statistics 1999, Table 3.4, pp. 40-42.).

APPENDIX B: DATA SUMMARY

TABLE B.1: NUMBER OF OBSERVATIONS USED IN ANALYSIS

Year or Period	Total No. of observations	Observations Used in Analysis		
		Number	LTU27[1]	LTU52[2]
1988	2952	1585	670	397
1989	11316	7841	3217	1805
1990	11689	11390	4368	2017
1991	11789	11639	5239	2633
1992	11881	11707	4835	2151
1993	11682	11574	4347	1787
1994	10767	10765	3530	1318
1995	10614	10610	3416	1243
1996	10341	10339	3009	813
1997	6969	4250	456	0
1988-97	100000	91700	33087	14164

Notes: **(1)** LTU27 represents the New Zealand definition of long-term unemployment being a period of more than 27 weeks

(2) LTU52 represents the OECD definition of LTU being a period of 52 weeks or longer.

TABLE B.2: DATA SUMMARY - MEAN DURATION AND AGE

Year or Period	Mean Duration of Unemployment (Weeks)	Average Age (Years)
1988	46.77	27.86
1989	42.47	28.50
1990	36.07	28.37
1991	39.13	28.73
1992	32.64	28.89
1993	29.23	28.86
1994	24.89	28.77
1995	23.66	28.76
1996	20.57	29.01
1997	12.71	30.61
1988-97	30.31	28.82

TABLE B.3: DATA SUMMARY FOR PERIOD 1988-1997

Variable	Mean or Proportion	Mean Duration (weeks)
Unemployment Duration (weeks)	30.29	30.29
Age in years	28.95	
Gender		
Female	0.40	24.85
Male	0.60	32.10
Ethnicity		
Sole Maori	0.19	34.58
Mixed Maori	0.07	29.51
Pacific Islander	0.07	32.27
Other	0.05	25.30
NZ European/Pakeha	0.62	27.59
Education		
Less than three years schooling	0.44	33.59
Less than three School Certificate passes	0.14	28.34
Three or more School Certificate passes	0.12	26.45
Higher School Certificate, Bursary, etc.	0.16	24.73
Post Secondary / Trade qualifications	0.06	26.04
Other School qualifications	0.02	26.00
University degree	0.06	24.25
Location		
East Coast	0.07	27.81
Auckland	0.27	30.72
Canterbury	0.10	27.89
Nelson	0.05	25.62
Waikato	0.06	30.33
Central	0.06	28.16
Northland	0.05	36.42
Southern	0.10	27.13
Bay of Plenty	0.09	30.12
Taranaki	0.06	30.58
Wellington	0.09	30.04

APPENDIX C: LTU REGRESSION RESULTS

TABLE C.1A: LTU27 REGRESSION RESULTS FOR THE YEARS 1988-1993[1]

Variable	YEAR					
	1988	1989	1990	1991	1992	1993
AGE	0.30401	0.01633	0.00586	0.00700	0.00493	0.00148
	(5.51)	(7.08)	(3.07)	(3.83)	(2.74)	(0.80)
FEMALE	-0.15980	-0.28002	-0.29918	-0.45391	-0.27897	-0.34254
	(-1.42)	(-5.62)	(-7.29)	(-11.49)	(-7.12)	(-8.55)
SOLE MAORI	-0.08818	-0.07293	0.29988	0.37101	0.20742	0.27923
	(-0.68)	(-1.21)	(5.43)	(6.76)	(3.71)	(5.06)
MIXED MAORI	-0.37588	-0.08244	0.09164	0.12371	0.11488	0.24325
	(-1.60)	(-0.81)	(1.17)	(1.65)	(1.58)	(3.26)
PACIFIC ISLAND	-0.34189	-0.24076	0.08501	0.27161	0.22019	0.39029
	(-1.49)	(-2.36)	(0.99)	(3.19)	(2.68)	(4.59)
OTHER	-0.30258	-0.38698	-0.16978	-0.12320	-0.12439	0.16923
	(-0.77)	(-2.42)	(-1.44)	(-1.18)	(-1.22)	(1.73)
NO SCHOOL/ LESS THAN THREE YEARS SECONDARY	-0.06187	0.06650	0.12504	0.25181	0.31245	0.28996
	(-0.17)	(0.49)	(1.35)	(2.73)	(3.61)	(3.35)
LESS THAN 3 SCHOOL CERT. PASSES	-0.41924	-0.28070	0.03879	0.20223	0.15301	0.19991
	(-1.11)	(-1.92)	(0.38)	(2.01)	(1.60)	(2.09)
THREE OR MORE SCHOOL CERT. PASSES	-0.30715	-0.16882	-0.10348	0.05919	0.04592	0.03184
	(-0.79)	(-1.13)	(-1.01)	(0.59)	(0.48)	(0.32)
HSC, 6TH FORM CERT., BURSARY, UE	-0.63282	-0.07938	-0.14440	0.00792	0.03127	0.05568
	(-1.61)	(-0.53)	(-1.43)	(0.08)	(0.34)	(0.59)
POST SECONDARY/ TRADE	-0.05200	0.15875	-0.17762	0.00937	-0.01760	-0.04131
	(-0.12)	(0.95)	(-1.50)	(0.08)	(-0.16)	(-0.37)
OTHER SCHOOL	-0.60985	-0.13101	0.10288	-0.18679	-0.05714	0.02429
QUALIFICATION	(-0.93)	(-0.48)	(0.56)	(-1.02)	(-0.35)	(0.15)
EAST COAST	-0.68079	-0.16890	-0.46086	-0.21153	-0.17441	-0.36171
	(-2.50)	(-1.43)	(-4.51)	(-2.13)	(-1.81)	(-3.70)
AUCKLAND	0.34445	0.11962	0.05466	-0.11268	-0.08301	-0.32225
	(1.51)	(1.23)	(0.70)	(-1.50)	(-1.13)	(-4.30)
CANTERBURY	0.33845	-0.22374	-0.11025	-0.03993	0.03959	-0.04894
	(1.27)	(-1.94)	(-1.22)	(-0.45)	(0.45)	(-0.56)
NELSON	-0.32989	-0.55660	-0.34211	-0.12299	-0.18886	-0.23882
	(-1.12)	(-4.30)	(-3.07)	(-1.14)	(-1.77)	(-2.25)
WAIKATO	-0.24027	-0.25820	-0.15966	0.02587	-0.20056	-0.24510
	(-0.86)	(-2.12)	(-1.57)	(0.26)	(-2.02)	(-2.42)
CENTRAL	-0.45758	-0.30585	-0.42474	-0.11051	-0.05389	-0.31481
	(-1.62)	(-2.48)	(-4.03)	(-1.10)	(-0.54)	(-3.14)
NORTHLAND	0.21729	-0.01746	-0.00199	0.17352	0.16727	-0.07931
	(0.73)	(-0.13)	(-0.02)	(1.61)	(-1.52)	(-0.70)
SOUTHERN	-0.56359	-0.42815	-0.17148	-0.23953	-0.03161	-0.27871
	(-2.13)	(-3.93)	(-1.86)	(-2.46)	(-0.36)	(-3.07)
BAY OF PLENTY	-0.04010	-0.18105	-0.08586	-0.09497	-0.06659	-0.15771
	(-0.16)	(-1.59)	(-0.90)	(-1.02)	(-0.73)	(-1.71)
TARANAKI	-0.02433	-0.10586	-0.28047	-0.07576	-0.01637	-0.28617
	(-0.09)	(-0.83)	(-2.55)	(-0.72)	(-0.16)	(-2.78)
CONSTANT	-0.75206	-0.50295	-0.48621	-0.37431	-0.53849	-0.45520
	(-1.74)	(-2.96)	(-3.94)	(-3.13)	(-4.71)	(-3.94)
LRT[2]	106.12	213.61	230.57	333.28	186.63	224.81
MADDALA R^2	0.06476	0.02688	0.02004	0.02823	0.01582	0.01924
CRAGG-UHLER R^2	0.08705	0.03623	0.03723	0.03776	0.02131	0.02621
MCFADDEN R^2	0.04915	0.02012	0.01520	0.02081	0.01176	0.01467
% OF RIGHT PREDICTION	61.33	60.17	61.93	58.02	59.38	62.64

Notes

(1) LTU27 refers to the New Zealand definition of LTU. LTU is an unemployment duration of 27 weeks or longer.

(2) LRT = Likelihood ratio test.

Figures in parentheses are t-ratios. Critical t values at the 10% level equals 1.645. Coefficients with t-ratios lower than this critical value are statistically insignificant at the 10% level.

TABLE C.1B: LTU27 REGRESSION RESULTS FOR YEARS 1994-1997 AND PERIOD 1988-97[1]

Variable	YEAR OR PERIOD				
	1994	1995	1996	1997[3]	1988-1997
AGE	0.00465	0.00160	0.00565	-0.00201	0.00470
	(2.36)	(0.78)	(2.74)	(-0.42)	(7.08)
FEMALE	-0.27982	-0.34156	-0.38459	-0.16711	-0.34655
	(-6.56)	(-7.93)	(-8.52)	(-1.64)	(-24.06)
SOLE MAORI	0.30273	0.28140	0.08449	0.11290	0.19001
	(5.26)	(4.80)	(1.36)	(0.76)	(9.79)
MIXED MAORI	0.17882	0.08464	0.09200	0.11870	0.07980
	(2.27)	(1.03)	(1.10)	(0.62)	(2.93)
PACIFIC ISLAND	0.22556	0.07936	-0.03363	0.07954	0.08400
	(2.60)	(0.90)	(-0.36)	(0.39)	(2.82)
OTHER	0.02366	0.22706	0.04810	0.22700	-0.13035
	(0.23)	(2.64)	(0.56)	(1.26)	(-3.85)
NO SCHOOL/ LESS THAN THREE YEARS SECONDARY	0.37802	0.21768	0.22998	-0.15192	0.28383
	(4.13)	(2.55)	(2.65)	(-0.77)	(9.10)
LESS THAN 3 SCHOOL CERT. PASSES	0.23363	0.05080	-0.02752	0.06667	0.13079
	(2.28)	(0.52)	(-0.27)	(0.31)	(3.77)
THREE OR MORE SCHOOL CERT. PASSES	0.06869	-0.03453	0.03966	-0.11507	0.05920
	(0.65)	(-0.34)	(0.38)	(-0.49)	(1.67)
HSC, 6TH FORM CERT., BURSARY, UE	0.21182	-0.35716	0.00391	-0.11349	0.03889
	(2.14)	(-0.38)	(0.04)	(-0.53)	(1.14)
POST SECONDARY/ TRADE	0.07682	0.30217	-0.12077	-0.26150	0.02962
	(0.64)	(0.26)	(-0.99)	(-0.96)	(0.74)
OTHER SCHOOL QUALIFICATION	0.07610	0.30076	-0.04447	-0.04079	-0.00226
	(0.42)	(0.18)	(-0.26)	(-0.12)	(-0.04)
EAST COAST	-0.20134	-0.06239	-0.11682	-0.15472	-0.23680
	(-2.03)	(-0.59)	(-1.05)	(-0.55)	(-6.70)
AUCKLAND	-0.38126	-0.16766	-0.27387	-0.33476	-0.15703
	(-4.75)	(-2.05)	(-3.25)	(-1.63)	(-5.74)
CANTERBURY	-0.31131	-0.09200	-0.32795	0.08768	-0.13045
	(-3.29)	(-0.94)	(-3.25)	(0.37)	(-4.03)
NELSON	-0.41640	0.04090	-0.17739	-0.08376	-0.25212
	(-3.45)	(0.34)	(-1.47)	(-0.29)	(-6.42)
WAIKATO	-0.28628	-0.00998	-0.33048	-0.37700	-0.18277
	(-2.71)	(-0.09)	(-2.87)	(-1.28)	(-5.02)
CENTRAL	-0.40874	-0.21233	-0.24236	-0.05829	-0.25899
	(-3.77)	(-1.93)	(-2.15)	(-0.20)	(-7.07)
NORTHLAND	-0.09530	-0.01100	-0.34866	-0.18800	-0.03675
	(-0.81)	(-0.09)	(-2.75)	(-0.66)	(-0.92)
SOUTHERN	-0.27632	-0.12890	-0.36329	-0.01513	-0.24897
	(-2.92)	(-1.31)	(-3.54)	(-0.64)	(-7.66)
BAY OF PLENTY	-0.35648	-0.35576	-0.45498	-0.28828	-0.22833
	(-3.63)	(-3.45)	(-4.30)	(-1.17)	(-6.81)
TARANAKI	-0.28194	-0.12563	-0.16704	-0.47591	-0.20456
	(-2.52)	(-1.12)	(-1.43)	(-1.64)	(-5.40)
CONSTANT	-0.78841	-0.70801	-0.75607	-1.75171	-0.60235
	(-6.49)	(-5.81)	(-6.07)	(-5.99)	(-14.28)
LRT[2]	188.64	165.52	159.36	18.60	1392.89
MADDALA R^2	0.01737	0.01548	0.01529	0.00437	0.01507
CRAGG-UHLER R^2	0.02420	0.02164	0.02183	0.00884	0.02066
MCFADDEN R^2	0.01385	0.01241	0.01278	0.00642	0.01161
% OF RIGHT PREDICTION	67.15	67.80	70.90	89.27	63.88

Notes

(1) LTU27 refers to the New Zealand definition of LTU. LTU is an unemployment duration of 27 weeks or longer.

(2) LRT = Likelihood ratio test.

(3) The critical value for the chi-square distribution at the 10% level with 22 degrees of freedom is 30.89. The LRT critical value for 1997 was less than this value and hence suggests the model is no better than just the constant and zero for the variables.

Figures in parentheses are t-ratios. Critical t values at the 10% level equals 1.645. Coefficients with t-ratios lower than this critical value are statistically insignificant at the 10% level.

TABLE C.2A: LTU52 REGRESSION RESULTS FOR THE YEARS 1988-1993[1]

Variable	YEAR					
	1988	1989	1990	1991	1992	1993
AGE	0.03650	0.01984	0.01207	0.01281	0.01007	0.01024
	(6.28)	(7.67)	(5.12)	(6.08)	(4.53)	(4.26)
FEMALE	-0.33834	-0.34190	-0.47399	-0.46728	-0.30843	-0.38922
	(-2.53)	(-5.68)	(-8.66)	(-9.59)	(-6.07)	(-7.06)
SOLE MAORI	0.03738	-0.02105	0.43257	0.49455	0.30325	0.36666
	(0.25)	(-0.30)	(6.46)	(8.04)	(4.44)	(5.20)
MIXED MAORI	-0.18163	0.01045	0.19859	0.12980	0.23173	0.27406
	(-0.66)	(0.09)	(2.02)	(1.44)	(2.57)	(2.79)
PACIFIC ISLAND	-0.06581	-0.02445	0.28182	0.35978	0.25963	0.36821
	(-0.26)	(-0.22)	(2.74)	(3.77)	(2.60)	(3.46)
OTHER	0.16933	-0.31971	0.17778	0.06523	0.01119	-0.08594
	(0.40)	(-1.68)	(1.23)	(0.52)	(0.86)	(-0.62)
NO SCHOOL/ LESS THAN THREE YEARS SECONDARY	0.06169	0.27949	0.57117	0.45629	0.40910	0.51757
	(0.16)	(1.69)	(4.25)	(3.86)	(3.49)	(4.06)
LESS THAN 3 SCHOOL CERT. PASSES	-0.63231	-0.04896	0.49058	0.37573	0.21030	0.32145
	(-1.52)	(-0.28)	(3.39)	(2.95)	(1.63)	(2.29)
THREE OR MORE SCHOOL CERT. PASSES	-0.41060	-0.07525	0.20723	0.21319	0.09001	0.16290
	(-0.96)	(-0.41)	(1.40)	(1.65)	(0.69)	(1.13)
HSC, 6TH FORM CERT., BURSARY, UE	-0.56082	-0.11467	0.06335	-0.00557	0.12485	0.22392
	(-1.29)	(-0.63)	(0.43)	(-0.04)	(0.98)	(1.60)
POST SECONDARY/ TRADE	-0.06226	0.14104	0.24133	-0.01246	0.11114	0.08472
	(-0.14)	(0.70)	(1.46)	(-0.09)	(0.77)	(0.52)
OTHER SCHOOL QUALIFICATION	-0.76531	0.26362	0.13574	0.15781	0.24673	0.31089
	(-0.99)	(0.85)	(0.51)	(0.70)	(1.18)	(1.34)
EAST COAST	-0.38037	-0.28386	-0.39865	-0.57801	-0.30439	-0.64564
	(-1.20)	(-2.07)	(-2.88)	(-4.72)	(-2.47)	(-4.79)
AUCKLAND	0.53823	0.15489	0.20243	-0.11612	-0.06096	-0.22832
	(2.08)	(1.42)	(1.98)	(-1.32)	(-0.67)	(-2.38)
CANTERBURY	0.37660	-0.46674	0.16485	-0.13507	-0.03534	-0.22832
	(1.24)	(-3.39)	(1.39)	(-1.28)	(-0.32)	(-1.96)
NELSON	-0.25717	-0.68917	-0.29086	-0.42521	-0.28789	-0.61615
	(-0.73)	(-4.38)	(-1.89)	(-3.13)	(-2.06)	(-4.01)
WAIKATO	-0.17094	-0.46158	0.14491	-0.55284	-0.18854	-0.31877
	(-0.52)	(-3.17)	(1.11)	(-0.48)	(-1.50)	(-2.37)
CENTRAL	-0.21794	-0.25075	-0.10726	-0.18215	-0.15945	-0.28623
	(-0.65)	(-1.77)	(-1.41)	(-1.52)	(-1.26)	(-2.17)
NORTHLAND	0.33628	0.03204	0.21997	0.06988	0.20778	0.16529
	(1.00)	(0.21)	(1.56)	(0.58)	(1.59)	(1.22)
SOUTHERN	-0.39498	-0.71843	-0.09607	-0.21734	-0.23302	-0.56451
	(-1.26)	(-5.46)	(-0.78)	(-2.95)	(-2.05)	(-4.49)
BAY OF PLENTY	-0.27803	-0.17080	0.00485	-0.05852	-0.12061	-0.17273
	(-0.93)	(-1.31)	(0.04)	(-0.54)	(-1.05)	(1.46)
TARANAKI	0.18174	-0.18451	0.24734	-0.13995	-0.12323	-0.23244
	(0.57)	(-1.26)	(1.82)	(-1.12)	(-0.92)	(1.75)
CONSTANT	-1.93843	-1.58226	-2.29613	-1.70883	-1.90762	-2.05208
	(-4.15)	(-7.87)	(-13.38)	(-11.55)	(-12.73)	(-12.74)
LRT[2]	122.28	273.66	330.89	405.12	179.07	253.18
MADDALA R^2	0.07425	0.03430	0.02863	0.03421	0.01518	0.02164
CRAGG-UHLER R^2	0.10990	0.05196	0.04717	0.05209	0.02469	0.03750
MCFADDEN R^2	0.06853	0.03235	0.03111	0.03255	0.01603	0.02542
% OF RIGHT	76.03	76.99	82.29	77.39	81.63	84.56

Notes

(1) LTU52 refers to the OECD definition of LTU. LTU is an unemployment duration of 52 weeks or longer.

(2) LRT = Likelihood ratio test.

Figures in parentheses are t-ratios. Critical t values at the 10% level equals 1.645. Coefficients with t-ratios lower than this critical value are statistically insignificant at the 10% level.

TABLE C.2B: LTU52 REGRESSION RESULTS FOR THE YEARS 1994-1997 AND PERIOD 1988-1997[1]

Variable	YEAR OR PERIOD				
	1994	1995	1996	1997[3]	1988-1997
AGE	0.01329	0.00493	0.00740	-	0.01071
	(4.58)	(1.69)	(2.19)	-	(12.55)
FEMALE	-0.37862	-0.40258	-0.42722	-	-0.35588
	(-5.70)	(-5.93)	(-5.16)	-	(-21.62)
SOLE MAORI	0.53793	0.32571	0.12485	-	0.29749
	(6.91)	(3.98)	(1.23)	-	(12.03)
MIXED MAORI	0.20680	0.16227	0.16968	-	0.11834
	(1.82)	(1.39)	(1.25)	-	(3.28)
PACIFIC ISLAND	0.33964	-0.05981	-0.01593	-	0.14238
	(2.85)	(-0.46)	(-0.11)	-	(3.76)
OTHER	0.13285	0.07987	-0.21714	-	-0.20261
	(0.90)	(0.63)	(-1.39)	-	(-4.21)
NO SCHOOL/ LESS THAN THREE YEARS SECONDARY	0.50039	0.17285	0.43343	-	0.53424
	(3.48)	(1.39)	(2.76)	-	(11.71)
LESS THAN 3 SCHOOL CERT. PASSES	0.48575	-0.04605	0.20591	-	0.34793
	(3.08)	(-0.22)	(1.14)	-	(6.93)
THREE OR MORE SCHOOL CERT. PASSES	0.23469	-0.16647	0.19405	-	0.22214
	(1.42)	(-1.10)	(1.04)	-	(4.31)
HSC, 6TH FORM CERT., BURSARY, UE	0.27036	-0.43900	0.16980	-	0.14937
	(1.72)	(-0.32)	(0.97)	-	(2.96)
POST SECONDARY/ TRADE	0.13270	-0.11838	-0.10559	-	0.16774
	(0.71)	(-0.67)	(-0.46)	-	(2.89)
OTHER SCHOOL QUALIFICATION	0.09851	-0.40663	0.13560	-	0.15700
	(0.34)	(-1.45)	(0.45)	-	(1.79)
EAST COAST	-0.47443	-0.28078	-0.64037	-	-0.44432
	(-3.36)	(-1.75)	(-3.27)	-	(-9.25)
AUCKLAND	-0.34309	0.10318	-0.21557	-	-0.06614
	(-3.09)	(0.86)	(-1.62)	-	(-1.86)
CANTERBURY	-0.19962	-0.15622	-0.33738	-	-0.15957
	(-1.51)	(-1.05)	(-2.06)	-	(-3.69)
NELSON	-1.11900	-0.03562	-0.43665	-	-0.45808
	(-5.08)	(-0.20)	(-2.13)	-	(-8.28)
WAIKATO	-0.19483	0.19551	-0.43071	-	-0.14947
	(-1.34)	(1.23)	(-2.26)	-	(-3.13)
CENTRAL	-0.28483	-0.09714	-0.50640	-	-0.23532
	(-1.89)	(-0.60)	(-2.63)	-	(-4.84)
NORTHLAND	0.04020	0.21159	-0.35403	-	0.07564
	(0.26)	(1.25)	(-1.74)	-	(1.52)
SOUTHERN	-0.46651	-0.12402	-0.46878	-	-0.37929
	(-3.36)	(-0.84)	(-2.77)	-	(-8.56)
BAY OF PLENTY	-0.23974	-0.23442	-0.60682	-	-0.19494
	(-1.79)	(-1.53)	(-3.42)	-	(-4.44)
TARANAKI	-0.41645	0.17313	-0.17076	-	-0.13746
	(-2.57)	(1.10)	(-0.93)	-	(-2.79)
CONSTANT	-2.46600	-2.12559	-2.47825	-	-2.12168
	(-13.56)	(-11.88)	(-11.68)	-	(-36.12)
LRT[2]	215.63	120.28	86.81	-	1740.16
MADDALA R^2	0.01983	0.01127	0.00836	-	0.01880
CRAGG-UHLER R^2	0.03781	0.02191	0.01974	-	0.03257
MCFADDEN R^2	0.02694	0.01569	0.01524	-	0.02205
% OF RIGHT PREDICTION	87.76	88.29	92.14	-	84.55

Notes

(1) LTU52 refers to the OECD definition of LTU. LTU is an unemployment duration of 52 weeks or longer.

(2) LRT = Likelihood ratio test.

(3) Results for 1997 could not be obtained as the maximum unemployment duration of the sample was 51 weeks - hence, no LTU observations.

Figures in parentheses are t-ratios. Critical t values at the 10% level equals 1.645. Coefficients with t-ratios lower than this critical value are statistically insignificant at the 10% level.

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