
DISABILITY EXPERIENCE AND ECONOMIC CORRELATIONS

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ABSTRACT

There is anecdotal evidence of the influence of economic conditions on disability claims costs and the proposition is generally accepted. However, there has only been a limited amount of “hard” evidence published in relation to this assumed correlation both in Australia and overseas. This paper examines three distinct measures of disability experience in Australia. These are claim incidence and claim duration for insured disability data and the proportion of the working population disabled, which is obtained from the number of recipients of a Commonwealth disability pension. As there is no universally agreed measure of “the economy”, a range of economic variables is analysed, and the resulting correlations with the measures of disability experience determined

For each measure of disability a statistically significant relationship is indicated.

The authors consider the extent to which the observed correlation might be explained by other causes e.g. liberalisation of definitions, higher levels of claims awareness, looser underwriting, etc. Finally the authors predict the experience to be expected for the period after 1995 on the basis of their regression models and test this against the actual published industry experience.

Keywords: Disability Insurance, Economic Correlations

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1. INTRODUCTION

The rising claim costs and decreased profitability of disability income insurance products in the last ten years have stimulated heightened discussion of the drivers of disability claim experience. Many hypotheses have been advanced as to why claim experience has varied quite dramatically. De Ravin (1998) refers to the following concerning this behaviour:

- weaker underwriting standards;
- greater awareness of the cover and the right to claim;
- changing work ethic and social attitudes to insurance;
- changes in the economic environment;
- more liberal definitions of disability including “any one duty” definitions;
- weakening of other policy terms and conditions; and
- under-resourced or under-skilled claims management

In this paper we consider the hypothesis that a major contributor to the variation in disability experience is the economic environment. This is a field of research with some interesting features. First, the perceived relationship is often referred to in the literature on disability insurance. However, the research to date in this area has been limited and far from conclusive. Second, this relationship is usually only raised in times of poor disability experience. During times of good experience, the relationship between disability experience and the economy is mentioned only infrequently. Good performance in the disability industry is attributed to good business practices rather than the state of the economy.

The paper examines three measures of disability experience

- Incidence rates from Australian insured data
- Claim durations from Australian insured data
- Proportion of the population in receipt of a Commonwealth disability pension

The insured claims incidence and claim duration data is taken from the various published reports of the Institute of Actuaries of Australia Disability Committee covering the period 1974 to 1995. The Commonwealth disability pension data has been taken from publications of the Australian Bureau of Statistics and the former Department of Social Security.

In analysing the disability data we have recognized that there is a large amount of “noise” and we have, therefore, attempted to extract only the major characteristics of any correlation “signal” between that data and the various economic indicators. In our view, any more sensitive approach may have been seriously deflected by this “noise” and may not have picked up the correlation indications. During the analysis a number of simplifying assumption have been made consistent with this approach.

The issue of obtaining data, which would facilitate a more sensitive analysis, is an important outcome of this work and we have made specific suggestions as to the direction which the data collection and reporting might usefully take.

The paper is set out in the following sections

1. Introduction

This introduction

2. Other Analyses of Economic Correlations

A review of other published analyses of disability experience and economic correlations

3. Insured Claim Incidence

The derivation of a measure of the observed insured claim incidence rates

4. Insured Claim Duration

The derivation of measures of the observed insured claim durations

5. Government Disability Pensions

The derivation of a measure of the proportion of the population in receipt of a Commonwealth disability pension

6. Economic Measures

Discussion of the possible measures of the “economy” and the derivation of those used in the paper



7. Observed Correlations

Discussion of the statistical analyses carried out, the observed correlations and the regression models adopted

8. Comparison with Other Results

A comparison of the results of this research with the other published analyses

9. Alternative Explanations

Discussion of other explanations for the observed changes in experience including liberalisation of definitions and underwriting

10. Predictions for 1996 – 2000

A prediction of the expected rates for the period 1996 – 2000 based on the regression models adopted in this paper and the comparison of those predictions against the actual observed experience

11. Conclusions

The conclusions drawn from the analyses of the paper

Bibliography

Appendix A

Correlations between economic indicators

Appendix B

Details of the regression models

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2. OTHER ANALYSES OF ECONOMIC CORRELATIONS

2.1 Australia

To date, the research into the relationship between disability experience and economic conditions in Australia has been limited. In particular, there has been no detailed analysis of claim incidence rates and economic conditions. There had been some partial analysis of claim duration and the economic cycle.

In 1993 the Disability Committee attempted to provide a partial analysis of the effects of the economic cycle in their report for the period 1987 to 1991. The committee analysed the duration of claims closed for 2 week and 1 month deferment business. The committee stated, without providing details, that "the effect of the recession can be seen in the lengthening of average claim durations".

In that report the disability committee calculated the average length of closed claims for each calendar year. This is one way of analysing the duration of claims, and provides an indication of the trend in claims costs. The committee noted that claims closed in 1991 had the longest claim duration of the period of investigation for both the 2 week and 1 month deferment periods. They attributed much of this to the economic recession in Australia at that time. Claim costs had risen since the previous investigation mainly due to an increase in claim duration.

The disability committee gave a strong warning about the interpretation of data from this report; stating that 1987 to 1991 was a period of time during which Australia's economy moved into recession. The warning then stated, "since insured disability experienced is influenced by economic conditions care will be needed in interpreting the results of this report".

Overall, the disability committee made several assertions regarding the relationship between disability experience and economic conditions in their 1993 report. These assertions were made because the Australian economy moved into a recession during the investigation; at the same time average claim duration and cost were observed to increase.

The disability committee briefly referred to the impact of the economic environment in the 1997 report. No statistical analysis was reported regarding the nature of this relationship.

The committee acknowledged that average claim costs had risen substantially since the previous investigation. Part of this increase could be attributed to the economic environment, but other potential causes of the increase were unknown. The relationship in question was not referred to again in that report.

2.2 Canada

The department of *Human Resources Development Canada* has produced two articles concerning people with disabilities and factors affecting employment and labour force transitions. A key finding from these reports is that the percentage of persons with a disability represents an increasing proportion of the Canadian population, from 13% in 1986 to 16% in 1991 (Bunch and Crawford). This is a trend that has also been observed in many other countries. The reports indicate that age is an important influence on the employment status of people with disabilities and again this feature has been observed in other countries. This indicates the need to take into account the age structure of the population when analysing disability data, and when comparing trends over time. There does not appear to have been other published research into the relationship between disability experience and the economic environment.

2.3 U.S.A.

Doudna (1977) investigated the effect of selected economic variables on group long-term disability claims. He hypothesised that there was a significant relationship between changes in economic conditions and changes in long-term disability claims frequency.

In analysing prior statistical work, Doudna concluded that the previous work was neither comprehensive nor sufficiently definitive to test the hypothesis. In fact, there had only been one



Society of Actuaries report from 1962 that supported the hypothesis. This report was deemed inadequate because it dealt with life insurance disability riders, rather than stand alone disability insurance products. Therefore, Doudna attempted to build an econometric model, isolating important features of the relationship.

The economic variables considered by Doudna included unemployment, a measure of corporate profits and an index of consumer sentiment. The index of consumer sentiment represented consumers' attitude towards their personal financial situation and their outlook for the economy. The measure of corporate profits was analysed because it reflected the corporate view of the economy. It also gave an indication of the level of employer control in disability claims. That is, in times of poor economic conditions, employers may claim an employee to be disabled, when in fact they are not, and pass some of the costs onto the insurer. This fact is impossible to measure directly so corporate profit is used as the best approximation available for this behaviour.

Two-predictor regression models were used to test the economic variables separately. This resulted in significant correlation between the rate of disability claims and unemployment, and the rate of disability claims and consumer sentiment. The relationship between the rate of disability claims and corporate profits was affected by the influence of dummy variables, used to counter large fluctuations in the data.

Multiple regression analysis was then used to test the overall relationship. This revealed a significant correlation, with the coefficient of determination equal to 0.74. Doudna therefore concluded that there was enough evidence to infer a relationship between disability experience and economic conditions.

A major strength of this research is the fact that Doudna used quarterly insurance data. This meant that various lags between economic conditions and claims rates could be analysed. This breakdown of data is also a weakness in the investigation. Only three insurers out of a sample of thirteen were able to provide quarterly data, significantly reducing the volume of available data.

Another potential weakness in this research is that it is based on data that is over twenty years old. Since the late 1970's major changes in the structure of society and the economy have occurred.. World events can now have a much larger impact on individual economies. Technology has changed the way we do things, which has an impact on the level and type of work related injuries. This has a follow on effect, in the causes and costs of disability claims. Consequently, the results presented by Doudna may not be relevant to today's environment.

More recent research is presented by Lenser and Green (1994) in the Disability Newsletter. In this article Lenser and Green present a summary of their research and some preliminary results. They began by analysing incurred loss ratios because that data was readily available. This turned out to be an unreliable basis, because the nature of the disability market had changed substantially in recent times, distorting the trends in the loss ratios.

They then analysed statistics from reports by the Society of Actuaries, resulting in data points for the years 1969 to 1985 for both claim frequency and claim duration. After developing measures of disability experience, they collected a variety of economic statistics in areas such as gross domestic product, unemployment, consumer expectations, retail sales, auto sales and housing construction. A linear model was then developed based on these economic variables. The predicted rates from the model were then compared to the actual experience. The model proved to be fairly accurate in terms of both claim frequency and claim duration.

The key finding was that most of the variation in the model forecasts could be attributed to three of the economic statistics, namely, gross domestic product, employment and retail sales. The authors reached the logical conclusion that there is a relationship between disability experience and economic conditions, but the nature and degree of correlation will vary between economic statistics.

This research is more recent than the work by Doudna and covers a much longer period of investigation, allowing trends in the data to be detected more easily. The method used to calculate claim frequencies is similar to the method developed in this paper.

2.4 United Kingdom

Haberman and Walsh (1998) analysed permanent health insurance claim data looking for trends in claim inception rates. They investigated both pooled data and data categorised by sex and deferment period. A large number of generalised linear models and generalised additive models were produced, though none proved to be a good model of the claim inception rates. Yearly fluctuations were also considered but they did not result in improvements in the models.

As a final stage in their analysis, the authors considered the relationship to economic data. After reviewing the work of Lenser and Green, the authors tried three economic variables, namely a composite indicator of the economy produced by the Office of National Statistics; a composite index without the unemployment rate and the unemployment rate individually. The models produced did not result in a good fit to the data.

Overall, Haberman and Walsh reported that no evidence of trends in claim inception rate was identified. They were not able to establish a link between claim rates and the state of the economy from the eight years of data they considered.

This work contradicted earlier research by indicating that no significant relationship existed between claims experience and the state of the economy. This may be attributed to the shorter time frame investigated. The authors also state that some of the data was averaged over a four-year period. This is too long a time frame to compare to economic data and achieve realistic results.

In a more recent paper, Haberman and Renshaw (1999) analysed time trends in United Kingdom PHI recovery, mortality and claim inception transition intensities. Data from 1975 to 1994 inclusive was examined – a very similar time frame to the data analysed in this paper.

They undertook a complicated statistical and mathematical analysis of the claim inception intensities. The smoothed log claim inception intensities graphed by age and calendar year exhibit cyclical tendencies. The authors indicate that this suggests an association and possible causal link with economic indices. This is also identified as an area for further investigation, making allowance for changes in the eligibility conditions and payment levels, and changes in the taxation of the benefits.

The conflicting nature of these results with Haberman and Walsh (1998) indicates the time period considered might be an important factor influencing the apparent relationship between disability experience and the economy.

3. INSURED CLAIM INCIDENCE

3.1 Overview

The periodic reports of the Disability Committee provide a range of data on the incidence of insured disability claims. For most of this data the information is aggregated for the full period to which the report relates. The only data which is available on an annual basis are the number of new claims and the number of records in force. In order to have data which would produce substantive results in respect to the correlations (or lack thereof) with economic data it is essential to have a measure of the incidence rate experience for each single year. We have therefore derived an annual index of incidence rate experience from the published Disability Committee data as described in subsequent paragraphs.

3.2 Development of the model of exposure data

The Disability Committee began collecting data in 1974, though the volume of data at this time was quite small. Since 1979 the Disability Committee have been issuing regular reports each typically covering a five year period. However, the Disability Committee has not written a report consolidating all of the data collected since 1974. This is partly due to technology changing the way the data is collected and analysed - accessing some of the early data is a very time consuming and tedious process.

The most recent full Disability Committee Report was published in 1997, and covered the calendar years 1992 to 1995. This was the first report to use a four year period of investigation. This report contained the largest volume and the most detailed analysis of the data. Consequently, the structure of this report was used to determine the underlying structure of the model of exposure data.

3.2.1 Description of rating variables

The 1997 Disability Committee Report analyses the data by quinquennial age, sex, occupation class and deferment period. For use in our exposure model the definitions of the rating variables for age, sex and occupation class were not altered. However, there were seven categories of deferment, many of which contained less than five percent of the total data. It was decided to reduce the number of deferment categories from seven to two. The two categories with the largest volume of data were deferment of 2 weeks and 1 month. The 1 and 2 week classifications were combined to form the new 2 week classification; and the deferment periods equal to or greater than 1 month were combined to form the new 1 month category.

The final model of exposure data, therefore, consisted of the following rating variables:

- Sex: Male, Female
- Age: 22-62 (by five year intervals)
- Occupation Class: A, B, C, D
- Deferment: 2 Week, 1 Month

This translates to 144 cells of exposure data for each calendar year.

3.2.2 Constructing the distribution of exposure data

Exposure data was provided in the 1997 Disability Committee Report classified by sex, age, occupation class and deferment period for the whole period of investigation (Table B, 1997 Disability Committee Report). Initially, this exposure data was subdivided into calendar year groups. Then the distribution by sex, occupation group and deferment period was investigated to see how it had changed during the period of investigation. Corresponding changes were made to the distribution of exposure data.

For the purpose of our model, exposure data is required for each calendar year. This data is not directly available from the Disability Committee Report, so a proxy for exposure was used, namely the number of records in force for each calendar year. Table A, Section 1.2 of the 1997 Disability Committee Report contains the number of records in force at the end of each calendar year. However, this does not give an indication of how many records were in force during that year. To estimate the number of records in force during each calendar year the average of the number of records at year t-1

to t for $t=1992$ to 1995 was calculated. Dividing by the total number of records in force provided an approximation to the percentage of records in force for each calendar year. These percentages were then multiplied by the total exposure (from Table B) to calculate the exposure for each calendar year.

The number of records in force was also used to determine if the proportion of Male and Female lives insured changed during the course of the period of investigation. In 1992, 85% of the records in force were Male and 15% were Female. At the end of the period of investigation, this figure had only changed slightly with the percentage of Male records at 84% and the percentage of Female records at 16%. This was not a material change in the proportion of Male and Female records. As this observed change was quite small, the percentage of Males and Females was assumed to be 85 and 15 per cent respectively for the years 1992 to 1995. Hence, the model of exposure data did not have to be modified to reflect this assumption.

An examination of the number of records in force by sex and occupation group revealed no material changes. Changes between classes were of the order of magnitude of 1 to 3 percentage points between the beginning and end of the period of investigation. Therefore, the original subdivisions of the exposure by sex and occupation class were used for each calendar year.

After calculating the exposure for age, sex, and occupation class for each calendar year, the exposure was calculated by deferment period. The number of records in force at the beginning, end and total period of investigation are given in Table A, section 1.6 of the 1997 Disability Committee Report. The percentage of records with a deferment period of 2 weeks was approximately 39% at the beginning of the period of investigation. At the end of the period of investigation this figure was approximately 30%. This was considered a material change that needed to be built into the model.

The approach was to calculate the percentage of records with a 2 week deferment period for each calendar year. The values for the years 1991 and 1995 were fixed as these were provided in the Disability Committee Report, and the values for the intervening years were obtained by iteration so that the total was equal to the number of records with a deferment period of 2 weeks for the entire period of investigation. Constraints were used to ensure that the values produced were between 39% and 30%, and that the progression from year to year was relatively smooth. This resulted in the percentage of records with a 2 week deferment period at the 31st of December for each year 1991 to 1995. The average of each year $t-1$ to t was then calculated for $t=1992$ to 1995, to produce the values of a 2 week deferment period for each calendar year. The values of deferment of 1 month were calculated by using one minus the corresponding percentage for the 2 week deferment category. The resulting percentages for deferment are shown in Table 3.1 below.

Table 3.1: Deferment allocation for 1992 to 1995

Year	1992	1993	1994	1995
2 weeks	0.371	0.346	0.324	0.308
1 month	0.629	0.654	0.676	0.692

The values of exposure for the deferment category were obtained by multiplying the total exposure by age, occupation class and sex for each year by the deferment allocations.

Similar processes were followed for each other period reported on by the Disability Committee although the adjustment described above for deferment periods was applied to several of the other rating variables.

The last section of the model of exposure data was based on the years 1974 to 1983. The data for this ten year period was obtained from the 1980 and 1985 Disability Committee Reports. The 1980 Disability Committee Report contained some limited data for the years 1974 to 1978, while the 1985 Disability Committee Report contained data for the whole ten year period, but the years 1974 to 1978 are treated as one period for the purpose of the number of records in force. Due to the nature of the two Disability Committee Reports, it was decided to use them in conjunction to build a model of exposure data for the years 1974 to 1983. The exposure data available in this report was not as detailed as in later reports so further assumptions were required, especially regarding the distribution of exposure data by sex and occupation class.

Exposure data is provided by quinquennial age and deferment period on a Standard and Aggregate basis. The Standard table refers to the exposure of lives in occupation class A, B and C, while the Aggregate table refers to the total level of exposure.

The definition of Standard and Aggregate arose due to a change in the classification of occupation class. Until 1981 lives were classified as either manual or non-manual workers. In 1981, a new classification system was adopted using four categories that are broadly similar to the A, B, C and D classifications used in the rest of the model of exposure data. During this investigation greater than 85% of lives exposed belonged to the old non-manual category (the "new" A, B and C categories), which was referred to as the Standard by the Disability Committee.

To be consistent with the rest of the model of exposure data, it was decided to impose the new categories of occupation group to the pre 1981 data. The Standard table was subtracted from the Aggregate table to calculate the exposure for occupation group D. The exposure in the standard table was then assumed to be equally distributed over the occupation classes A, B and C.

The exposure for each calendar year was calculated in the same manner as for the other periods covered by Disability Committee Reports. The only modification occurred in combining data from the two reports and ensuring that the total number of records in force was the same in both cases.

The 1985 Disability Committee Report provides the number of records in force for the period 1970 to 1983 with 1973-1978 classified as one group, and the years 1979 to 1983 classified individually. The total number of records in force between 1973 and 1978 as reported in the 1985 Disability Committee Report was 840 greater than the number of records in force reported in the 1980 Disability Committee Report. The number of records in force for the year 1978 from the 1985 Report was used throughout this analysis.

The estimates for the percentage of exposure attributable to each calendar year were then multiplied by the total exposure. This resulted in an approximation to the exposure for each calendar year.

The 1985 Disability Committee Report did not classify the exposure data by sex. To include this classification in the model of exposure data the total exposure by occupation class and age was multiplied by the percentage of Males and Females for each year. The 1980 Disability Committee Report does not give the breakdown of Males and Females at the beginning and end of the period of investigation, only a figure for the total number of records for the period of investigation. Similarly, the 1985 Disability Committee Report only provides the total number of Male and Female records for the period of investigation. The percentage of Male records was approximately 98.5 for the years 1974 to 1978; this figure had dropped to approximately 95% for the entire ten year period. A linear fit for each year 1978 to 1983 was used to capture the trend towards an increasing proportion of Females. The percentages used for Males and Females for each calendar year are shown in table 3.2.

Table 3.2: Percentage of Male and Female records in force 1974 to 1983

Year	Male	Female
1974	0.985	0.015
1975	0.985	0.015
1976	0.985	0.015
1977	0.985	0.015
1978	0.985	0.015
1979	0.97	0.03
1980	0.96	0.04
1981	0.95	0.05
1982	0.94	0.06
1983	0.93	0.07

Next, the distribution of exposure data by deferment period was calculated. The average number of records in force with a 2 week deferment period for the years 1973 to 1980 and 1973 to 1983 were used as constraints for the progression of rates. Then the deferment rates for the 31st December each year were estimated. For the constraints to hold the appropriate percentages in the early years were



quite low. The average of these rates for consecutive years was not used because they caused a decrease in the percentages for 2 weeks deferment for the first seven years. The final progression of rates used in the model of exposure data are shown in the table below:

Table 3.3: *Deferment allocations for 1974 to 1983*

Year	2 Weeks	Expiry
1974	0.116	0.884
1975	0.146	0.854
1976	0.186	0.814
1977	0.246	0.754
1978	0.296	0.704
1979	0.316	0.684
1980	0.336	0.664
1981	0.34	0.66
1982	0.34	0.66
1983	0.34	0.66

3.3 Calculation of the Expected Number of Claims

The expected number of new claims was calculated using unadjusted CIDA for each calendar year. The CIDA tables have been widely used by Australian life offices and were used in the Disability Committee Reports until recent years when IAD was adopted.

The exposure data in each cell was then multiplied by the appropriate CIDA incidence rate according to the rating variables to produce the expected number of new claims.

3.4 Calculation of an index measure of claim experience

The actual number of new claims for each calendar year was included in the appropriate Disability Committee Reports for the years 1978 to 1995. For the years 1974 to 1978 only the total number of claims was provided (643). The number of claims each year for this period was approximated by multiplying the total number of claims by the percentage of records in force for each calendar year.

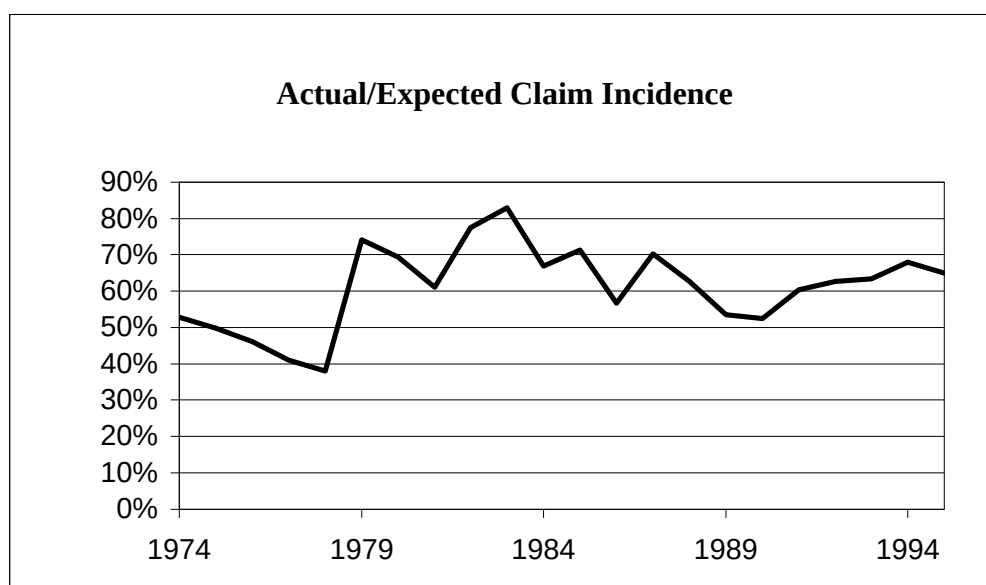
The actual number of new claims was then divided by the expected number of new claims for each year.

Table 3.4 contains the Actual/Expected ratios and Figure 3.1 shows a graph of the actual/expected ratios. The ratio of actual to expected claims appears to change quite markedly during this period. High volatility in the experience is evident between 1974 and 1984. This may be due to the significant changes that occurred in the disability market during this time, such as the increase in occupation classes covered and changing definitions of disability. After the early 1980s the experience appears to become less variable but shows an upward trend since 1990.

Table 3.4: *Actual/Expected Ratios*

Year	Actual/Expected %
1974	52.8
1975	49.8
1976	46.0
1977	41.0
1978	38.0
1979	74.2
1980	69.4
1981	61.1
1982	77.5
1983	83.0
1984	66.8
1985	71.3
1986	56.6
1987	70.3
1988	62.6
1989	53.5
1990	52.5
1991	60.4
1992	62.7
1993	63.3
1994	67.9
1995	65.0

Figure 3.1: *Actual/Expected for claim incidence*



4. INSURED CLAIM DURATION

Unlike the incidence rates, average claim duration cannot be calculated from the data in the disability committee reports. Instead, we rely on a proxy for average claim duration being provided in the most recent disability committee reports.

The 1995 disability committee report covered a period of investigation during which Australia entered a recession (1987 to 1991). A notable deterioration in claims experience prompted the disability committee to calculate the average length of claims closed by calendar year. The average length of claims for each calendar year was not calculated due to the large number of claims still open, potentially distorting the results. The average length of claims was reported for the entire period of investigation for those claims closed in the first year and first two years.

This calculation of average length of claims closed by year closed was repeated in the 1997 disability committee report, and will be used as the estimate of claim duration. The 1997 and 1995 reports provide data points for 1987 to 1995 inclusive, for the average length of claims by year closed.

Different claim duration patterns were observed for different deferment periods; consequently data on average claim duration by year closed was subdivided into the 2 weeks and 1 month deferment periods. Table 4.1 shows the observed durations (in days) of claims closed during each calendar year.

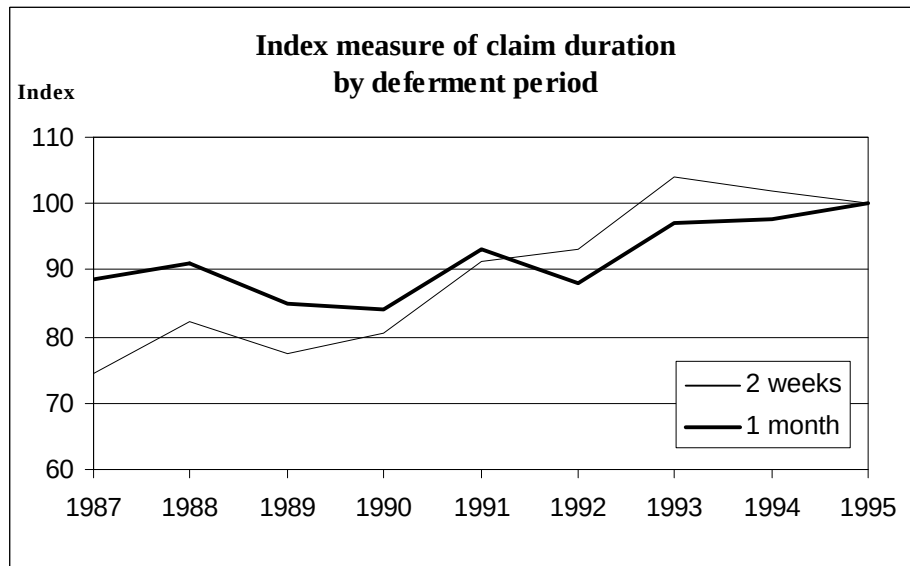
Table 4.1: Average Length of Claims Closed

Year	Deferment: 2 weeks (days)	Deferment: 1 month (days)
1987	76	118
1988	84	121
1989	79	113
1990	82	112
1991	93	124
1992	95	117
1993	106	129
1994	104	130
1995	102	133

It is desirable to analyse more than nine years of claim duration data, so that the impact of any large random fluctuations is mitigated. The disability committee noted that 1991, for example, saw a large rise in claim duration, much of which was attributed to the recession at that time. Unfortunately, the disability committee reports prior to 1993 only provided figures for average duration for the period of investigation, not by individual calendar years. These are not comparable with the average length of claim closed by calendar year. As a result statistical analysis of average claim duration for 1974-1983 and 1983-1987 is not appropriate. Any correlation with economic variables would be difficult to interpret due to the long period of time over which the average is calculated.

Therefore we have elected to use data on the average length of claims closed for 1987 to 1995. When this data is converted to an index measure, we see in Figure 4.1 that the 2 week deferment period is more variable than the 1 month deferment period. For both classes of deferment period, the average length of claim closed appears to be exhibiting a general upward trend.

Figure 4.1: *The index measure of claim duration and deferment period.*



5. GOVERNMENT DISABILITY PENSIONS

5.1 Overview

As an alternative to measuring insured disability data, it is useful to consider another measure of disability, namely the number of people receiving a Government disability pension in Australia. The aim of this section is to calculate this measure of disability each year and convert it to a form suitable for comparison with economic variables over the same period. This index will measure the proportion of the eligible population with a disability. This is distinct from the incidence of disability calculated in section 3, and the duration of disability claim calculated in section 4. The indices calculated in sections 3 and 4 have been standardised as far as possible to remove external causes of change in the data. It is not possible to standardise the number recipients of a disability pension in the same manner. Therefore there may be other factors, besides the economy, which influence the index. This means that the interpretation of this data and correlations with the economy requires more care. However, it is still a valid and useful approach to consider the relationship between the proportion disabled and the economy.

In Australia, the Commonwealth Invalid Pension was introduced in 1910. It was one of only three non-contributory schemes in existence worldwide at that time. To qualify for an Invalid Pension required the demonstration of permanent incapacity to work certified by a medical practitioner. The recipient also had to be over age 16. The structure of the Invalid Pension remained virtually unchanged until 1991 (Daniels, 1999).

In 1991, the Disability Support Pension replaced the Invalid Pension. The Disability Support Pension was designed to encourage recipients to seek employment, rehabilitation and a return to self sufficiency where practical. Although the structure of the disability pension changed, the overall number of people receiving the payment did not alter substantially. Therefore the number of people receiving an Invalid Pension prior to 1991 and Disability Support Pension after 1991 will be considered without specifically adjusting for the break in the series. For simplicity, both will be referred to as a disability pension.

5.2 Index construction

The number of people receiving a disability pension by itself is not a good indication of the level of disability in the community. As Australia's population has grown, so too has the number of people receiving a disability pension.

To obtain a more realistic measure of the level of disability, the number of people receiving a disability pension was scaled by an appropriate measure of exposure. Ideally this measure of exposure should be the number of people in Australia eligible for a disability pension each year by age - that is aged 16 to 65. The closest proxy available for all years analysed was the population at 30th June each year aged 15 to 65. This data was taken from quinquennial census data. For the intervening years the number of people was approximated by linear interpolation.

The number of people receiving a disability pension each year was then divided by the exposure as described above, to produce a standardised measure of the level of disability in Australia. This data is shown in Table 5.1.

Table 5.1: *Disability pension recipients as a Proportion of the Population aged 15 to 65*

Year	%
1974	1.80
1975	1.90
1976	2.04
1977	2.22
1978	2.21
1979	2.33
1980	2.39
1981	2.28
1982	2.18
1983	2.18
1984	2.34
1985	2.48
1986	2.57
1987	2.67
1988	2.69
1989	2.74
1990	2.69
1991	2.89
1992	3.24
1993	3.45
1994	3.67
1995	3.86

Figure 5.1: *Disability pension recipients as a Proportion of the Population aged 15 to 65*

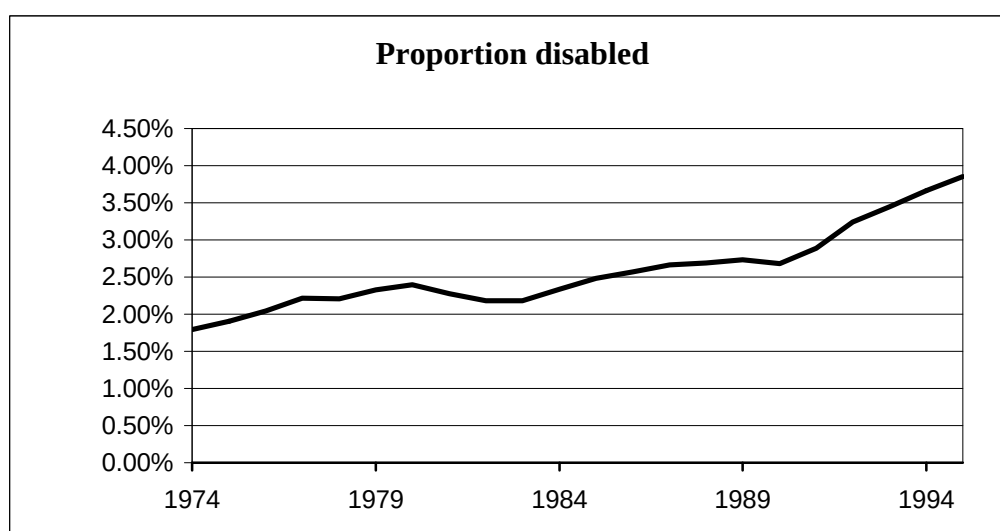


Figure 5.1 shows that the proportion of the population with a disability has generally been increasing over time. The steepest increase has occurred between 1990 and 1995, which may be partly due to the change in structure of the disability pension in 1991. The proportion of people receiving a disability pension remained fairly constant between 1978 and 1985.

The difficulty with the available data is that it shows only the “in force” pensions. To properly understand the impact of economic conditions we need the new pensions and the duration of the “in force” pensions standardised to remove the impact of changing age distributions. This situation was investigated, but the data was not readily available from Centrelink, the Department of Social Security or the Social Security Journal. Where some of the required data was available it was not available in sufficient historical length to be useful in the analysis. As a result, only the “in force” data has been analysed. The significance of any conclusions is clearly constrained by these data limitations. A more detailed reporting regime is desirable in the future if we are to understand the economic correlations in more detail. The issue is clearly a subject worthy of further research.

6. ECONOMIC MEASURES

6.1 Background

There is no universally agreed single measure of the economy. Data on interest rates, unemployment, GDP and inflation are frequently quoted in the media, but this is by no means a definitive list of economic variables. Other measures such as the number of bankruptcies and retail sales are also useful in explaining aspects of the economy. Each economic statistic captures some part of the economy, but no measure has been found that adequately describes the overall situation.

Attempts have been made to produce composite indicators of the economy. These composite indicators distinguish between leading, coincident and lagging economic variables. In general, these indicators are not useful for statistical analysis because they are presented in the form of deviations from a long term trend. The Australian Bureau of Statistics *Experimental Composite Leading Indicator of the Australian Business Cycle* is a good example of a composite index in this form. In addition, the historical length of these indicators is generally not sufficient to compare to the disability data.

For the purposes of examining the hypothesised relationship between disability claims and the economy we are interested in those economic measures which might be causally related to the incidence or continuation of disability claims, whether insured or government benefits. Virtually all definitions of disability used in insured or government benefits, are intimately related to the ability to perform work for remuneration. It is generally agreed by most commentators that it is not only the ability to work but also the willingness to work which is important. The real risk in disability income insurance is not that the insured suffers a disability and is unable to work but that having suffered a disability the insured decides not to work! It seems reasonable to assert, therefore, that those economic measures which relate to the level of employment are the ones with which we should expect correlation with the level of claims.

While the motivation and willingness to work are not necessarily directly driven by economic considerations alone there is likely to be a complex set of feed-back mechanisms which do have economic conditions as one of the inputs to the overall measurement of the willingness to work. However, the ability, regardless of motivation, to work is clearly impacted by the extent to which work is readily available. In addition, the higher the demand for workers the higher the potential for employers to hire workers whose disability may restrict their capacity for work.

Many measures used for the “economy” are either driven by employment or lead to it e.g. retail sales, housing starts. We have concentrated on those measures which are more directly related to employment e.g. unemployment rates, participation rates, levels of bankruptcy. This latter measure may be significant for the self-employed who constitute a material proportion of the customer base for insured disability.

Lenser and Green commented that “trying to find numerical correlations between economic statistics and disability statistics might be like trying to find the proverbial needle in the haystack”. The relevance of this statement became very clear to the authors during this part of the research!

The data for 24 economic measures were collected. In particular, those analysed in previous research (as described in section 2) were included for comparison. To compare the economic data with the disability data on the same basis, the economic data has, in some cases, been combined with other material to give proportional data. The details of each economic variable investigated are discussed in subsequent paragraphs. The statistical analysis is discussed in section 7.

6.2 Employment Statistics

Five direct measures of the labour force in Australia were collected. Sources of this data included the Reserve Bank Bulletin historical series and the Australian Bureau of Statistics Economic Indicators publications. Where data was provided on a financial year basis, it was converted to a calendar year basis by assuming a uniform distribution over the financial year, and then taking the average over each pair of consecutive financial years. Employment statistics include the participation rate, the unemployment rate, the average hours worked, the percentage of long term unemployed and the number of job vacancies.



The participation rate is defined as the labour force as a percentage of the population aged over fifteen. The labour force is defined as the sum of those employed and those looking for work. The participation rate has ranged between 60 and 64 per cent for the last twenty years.

The unemployment rate is another measure of the state of the economy, and it is one of the most readily available measures. During times of economic downturn the unemployment rate increases leading to significant social and personal costs. Under the hypotheses in question, it is expected that a rise in the unemployment rate would see an increase in the number of disability claims.

The average hours worked is another statistic collected by the Australian Bureau of Statistics. Data is available from 1978, and there appears to be an upward trend in the average number of hours worked per week.

If a person is looking for work for more than fifty-two weeks in succession they are defined as long term unemployed. The longer a person is unemployed the harder it is for them to return to the workforce, which has significant social implications. During times of economic downturn the percentage of long term unemployed is observed to increase. The percentage of long term unemployed was the highest in 1993, just after the most recent recession in Australia. The lowest percentage of long term unemployed was in 1980 – the first year of available data. The highest percentage of long term unemployed occurred in 1993 at 36.3%.

Looking at the state of the economy and employment from a different perspective involves investigating the number of job vacancies. During times of expansion the number of job vacancies increases substantially, while in times of economic downturn the number of job vacancies is small. This is observed in the available data with only forty-eight vacancies per 1000 people observed in the recession in 1991. Data on the number of job vacancies is only available from 1980.

6.3 Bankruptcy Statistics

Each year, a report is issued into the operation of the Bankruptcy Act 1966 by the attorney general's department (previously the inspector general). This report contains details of the number of people who have gone bankrupt in the previous twelve months, as well as some historical data. The bankruptcy statistics included for analysis are the number of business and non-business bankruptcies as well as the total number of bankruptcies. Business related bankruptcy occurs when the individual's bankruptcy is directly related to their proprietary interest in a business. A non-business bankruptcy occurs where the bankrupt's occupation and cause of bankruptcy is not related to any proprietary interest in a business. The bankruptcy rates per 1000 people aged over 18 were calculated.

6.4 Measures of consumer sentiment

A measure of consumer sentiment is generally regarded as an important variable to consider when looking at the direction of the economy. Doudna, and Lenser and Green considered such a measure in their research. In Australia, a common measure of consumer sentiment is the *Westpac - Melbourne Institute Consumer Sentiment Index* produced by the Westpac-Melbourne Institute Centre for Business Cycle Analysis. The historical series of this data is available from the Reserve Bank internet site. The average of the quarterly index was calculated over each twelve month period to produce an index measure for each calendar year.

The Westpac - Melbourne Institute describes this survey as:

“The Consumer Sentiment Index is the average of five responses on consumers' evaluations of their household financial situation over the past year, the coming year and the next five years, anticipations of economic conditions over the coming year and the next five years and a view on buying conditions for major household items.” (Melbourne Institute of Applied Economic and Social Research web page)

This survey is conducted each quarter and questions relate to consumers “perceptions of changes to the level of unemployment over the coming year, buying conditions for cars and dwellings, the wisest place for savings and news about economic conditions”.



A measure of business confidence was also considered, but this series is not available prior to 1989, and so is not currently useful.

6.5 Measures of Production

The level of production in the economy as measured by Gross Domestic Product (GDP) is frequently quoted in the media as a measure of the state of the economy. In this case to avoid distorting the real trend in GDP, the effects of inflation and the size of the population have been taken into account. Therefore, real GDP per capita is the measure of production that was used.

As an alternate measure to GDP, there has been recent discussion of a Genuine Progress Indicator for Australia (GPI). The GPI attempts to measure changes in well-being and the sustainability of consumption by including changes in the value of capital stocks. For example, the value of household and community work is included as a positive component and the costs of pollution and land degradation are counted as negative items. The result is a measure of well-being that increases more slowly than GDP, and the gap between GDP and the GPI appears to be widening, especially since 1980. The measure of the GPI is difficult to calculate as it is hard to place a value on items such as the cost of pollution and household and community work. None the less it provides a useful measure of the changes in well-being over time. The GPI is also a more subjective measure of the economy than the other economic series considered. (Hamilton, 1997).

Two indexes of industrial production were obtained from the Australian Bureau of Statistics – the manufacturing and industrial series. These indices measure the production in the economy relative to a base year, classified by the manufacturing sector and the industrial sector.

An index series for the terms of trade was also obtained from Australian Bureau of Statistics. The terms of trade measure the ratio of export prices to import prices.

6.6 New Motor Vehicle Registrations

The number of new motor vehicle registrations is included in the *Bulletin* published by the Reserve Bank. The number of new motor vehicle registrations, by itself, is not very useful. Therefore, it was modified into a standardised measure so that it could more accurately reflect changes in the economy. First, the sum of the monthly data was calculated to determine the number of new motor vehicle registrations for each year. Second, the number of new registrations each year was divided by the number of people in the Australian population aged 16-80 at the 30th June of that year, to produce a standardised measure of the level of new motor vehicle registrations. This index series was produced for both passenger vehicles and other vehicles.

6.7 Crime Statistics

Levels of crime in Australia are an alternative way of measuring the well-being of society over time. Data was obtained on the rates of larceny, car theft, robbery and burglary from the Australian Institute of Criminology. These were defined as the number of offences reported each year per 100 000 population. Although crime statistics are not a direct measure of the economy, there is often an observable increase in levels of crime during times of economic downturn.

6.8 National Accounts

Three index series from the national accounts were used, namely, private final demand to total domestic demand, private non-farm inventory to sales and the household savings ratio. The household savings ratio has exhibited the most significant changes since 1978, with the general trend towards a lower percentage of income being saved. It is defined as the ratio of household net saving to gross disposable income. The value of final demand to total domestic demand and private non-farm inventory to sales have not changed materially since the series commenced in 1978. It is anticipated that there is very little correlation between disability claims experience and these measures of economic conditions.

6.9 Housing Statistics

The level of housing activity is another indication of the level of economic activity in Australia. The number of dwelling approvals for each calendar year was divided by an estimate of the number of households in Australia in that year. The number of households in Australia each year was interpolated from quinquennial census data. This produced a measure of the number of new dwellings approved per household.

6.10 Retail Statistics

Retail statistics was another measure previously considered in determining the relationship between disability claims experience and economic conditions. In this case the retail trade per person was obtained at 1997-98 prices. Unfortunately, this data series was only available from 1984, so the analysis of this data will be somewhat limited.

7. OBSERVED CORRELATIONS

7.1 Outline of statistical analysis

The first problem encountered in the analysis is the large number of potential variables compared to the number of data points available. There were 24 economic variables and only 22 disability experience observations for incidence rates! For claim duration the situation is even worse. In addition, there is significant correlation between a number of the economic variables. The full correlation matrix is set out in Appendix A.

Therefore, we have limited the analysis to include only 12 economic variables, namely

- Consumer confidence
- Participation rate
- Unemployment rate
- Hours worked
- Long term unemployment
- Job vacancies
- New passenger vehicle registrations
- Other vehicle registrations
- Real GDP per capita
- Business bankruptcy
- Non business bankruptcy
- Dwelling approvals

The other economic variables collected were excluded for a combination of reasons as discussed below.

The four economic variables for crime statistics were excluded on the basis of their significant correlation with other variables which were included and a difficulty of seeing a causal link between crime and disability experience. The secondary link between crime and the overall economy is acknowledged. Like the crime statistics, no causal link between the terms of trade and disability experience is obvious. The other four National Accounts variables were also excluded because of the absence of a causal link to disability experience. The GPI was excluded because of the concerns about the reliability of its construction due to the great difficulty of measuring some of its components and finally, the Retail Turnover variable was excluded because data was only available from 1984.

The Household Savings Ratio has declined steadily over eighteen years of observation. Such a consistent trend during several economic cycles suggests that some structural change has been occurring.

The second problem is the lack of data on many of the economic variables prior to 1980. In addition, the insured experience data prior to 1980 was quite limited in exposure, a major market participant was not contributing data and the occupation classifications changed materially in 1981. Also, as discussed in section 3, there were other less material data issues.

For these reasons we have restricted our statistical analysis to the data from 1980 onwards. While this may limit the confidence in the final results, in our view the alternative introduces as many uncertainties, although for other reasons.

7.2 Basic Approach

The statistical analysis carried out was a forward stepwise regression process using S-PLUS with the 12 economic variables as described in 7.1 above. In each case the procedure concluded with at most three significant variables included in the model. The variables included as a result of the statistical analysis are described in following paragraphs together with a qualitative analysis of their credibility. No lag was assumed between any of the disability or economic variables. Although data on the economic variables was generally available on a monthly basis, the disability data was only available on an annual basis. This means that only lags of one or two years could be analysed. This is likely to

be too long a period to detect any material lag impact. We carried out some preliminary analyses for one year lags which shown no material change from the no lag analysis. If the disability data was available in future on a quarterly basis then a sensitive analysis of the effect of lags could be performed.

7.3 Insured Incidence Experience

The modelling process resulted in two variables being included – Participation Rate and Non-Business Bankruptcies. With a p value of 0.0018 and an R^2 value of 0.621 this regression is statistically significant.

The Participation Rate is a useful indicator of structural changes in the labour market. It is easy to see why a causal link between disability experience and the Participation Rate is plausible. The Participation Rate is observed to decrease during times of recession due to the discouraged worker effect (Dornbush et al), which refers to people who have had difficulty finding employment becoming discouraged and leaving the labour market. This discouraged worker effect suggests that the Participation Rate picks up the community expectations as to the likelihood of finding work. It is not unreasonable to link a decline in these expectations with an increased propensity to claim disability benefits. As the Participation Rate falls, people begin to look for alternative sources of income potentially from disability benefits, causing an increase in the level of disability. These observations are consistent with the observance of a negative coefficient for the Participation Rate in the regression model.

We would have initially expected that the rate of Business Bankruptcy would be relevant given the high volume of disability benefits sold to the self-employed. However, it is not entirely clear how the distinction between business and non-business bankruptcy is interpreted, in practice, in the gathering of the data for the two indicators. There is little doubt that the incidence of bankruptcy will be a very useful indicator of the impact of economic conditions on individuals.

7.4 Insured Claim Duration

The problems associated with lack of data encountered in the analysis of incidence rates are compounded for the analysis of claim duration. There are only nine years of available data for average length of claims closed by calendar year. The data on average length of claims is, however, less variable and exhibits a general upward trend.

2 week Deferment Period

The stepwise procedure indicated two variables should be included in the model: the non-business bankruptcy rate and the percentage long term unemployed. With a p value of 0.0012 and an R^2 value of 0.895 these results are significant.

1 month Deferment Period

The stepwise procedure identified only the percentage long-term unemployed as the variable to include in the regression model. With a p value of 0.0232 and an R^2 value of 0.545 the significance of this regression is not as strong as for the other insured disability experience.

The non-business bankruptcy has been discussed in section 7.3.

As the economy contracts the need of employers to recruit workers will diminish. One impact of this phenomenon will be a growing reluctance among employers to hire those who have been unemployed for significant periods. Issues of motivation to work, the need for more extensive retraining and possible age discrimination will be part of the underlying reasons. In these circumstances the percentage of long-term unemployed will increase. Those who are attempting to return to work after a disability will exhibit many of the same characteristics as the long term unemployed. Even after a short duration disability there may be concern in the mind of an employer as to the possibility of recurrence. It is reasonable, then, to assert that the same underlying economic circumstances which cause a rise in the long-term unemployed will also have an impact on the duration of disability claims.

7.5 Non-insurance data – Government disability pension

The last type of disability data to investigate is the proportion of the population receiving a Government disability pension. The limitations of the data we have on this subject were discussed in section 5. As noted, this data is subject to much less variation than the insured data and there is a general upward trend in the proportion of people receiving a disability pension.

The stepwise procedure indicated that the variables to include in the model are the real per capita GDP, the consumer confidence indicator and business bankruptcy. The model had a p value of essentially zero and an R^2 value of 0.951. The model is highly significant.

The interpretation of the model is, however, not straightforward. While the inclusion of GDP and consumer confidence indicators seems obvious they are actually included with the opposite sign to that which we would expect. An increase in GDP leads to an increase in the value produced by the regression model. This is a plausible result for a multiple regression model where the inclusion of these variables with the positive sign is a means of damping the effect of the third variable. Business bankruptcy as a measure is likely to be a second-order effect where the circumstances which lead to an increase in business bankruptcy also lead to an increase in the proportion of the population receiving a Government disability pension.

It is crucial in interpreting this apparently significant regression to remember the limitations on the data. Changes in the age structure of the population, the definition of disability which leads to such a pension and changes in the surveillance of continued disability may have had material impacts on the proportions disabled. Although it is tempting to use this data as strong support for the hypothesis the results must be treated with caution until further work disaggregates the data so that true incidence rates can be obtained. The difficulty in interpreting the regression in a causal sense must also be borne in mind.

7.6 Alternative economic variables

In the preceding statistical analysis, the models derived produced the best fit to the data among models including the variables listed above. The predictor variables included are not always straightforward to interpret in a causal sense. In particular the inclusion of either the non-business bankruptcy rate or the business bankruptcy rate has raised issues of interpretation. The three regression models where these variables figured were re-run using the total bankruptcy rate in place of either of the other two rates. There was, not surprisingly, high correlation between total bankruptcies and its two sub components.

For insured incidence experience the substitution of total bankruptcies for non-business bankruptcies increased the p value from 0.0018 to 0.0024 and reduced the R^2 value from 0.621 to 0.604. Neither of these changes is material to the significance of the model. Hence, the total bankruptcies have been used in our final model.

For both the 2 week deferment claim durations' and the Government disability pensions' experience the difference caused by the substitution was trivial. Hence the total bankruptcy rate was also used in these two regression models.

7.7 Summary of Statistical Results

This analysis has produced regression models for each of our four different sets of disability experience with the results shown in Table 7.1. The details of the final models for each of the four measures of disability are contained in Appendix B.

Table 7.1: Statistical Results

Disability Data Set	Economic Variables	p value	R ² value	Significance
Incidence	Participation rate Total bankruptcies	0.0024	0.604	HIGH
Claim Duration – 2 weeks	Long-term unemployment Total bankruptcies	0.0015	0.886	VERY HIGH
Claim Duration – 1 month	Long-term unemployment	0.0232	0.545	MODERATE
Govt disability pensions	Consumer confidence Real per capita GDP Total bankruptcies	~ zero	0.951	VERY HIGH

The discussion has plausible qualitative explanations for each of the economic variables included in the models and there is some consistency between the models as to the variables included.

In the case of Government disability pensions considerable caution is suggested in the conclusions to be drawn despite the very high statistical significance.

These results are derived from a process that deliberately chose those variables which gave the best fit for the observed data. It is quite possible to choose other economic variables which give results that do not suggest high statistical significance for the resulting regression models. We may, therefore, conclude that while the general proposition of the dependence of disability experience on economic conditions is supported the extent of the correlation and the detailed process which leads from economic conditions to disability claims are not, as yet, well understood.

Nevertheless, in the authors' opinion, the results are credible evidence which supports the widely held view that disability experience is materially affected by economic conditions.

8. COMPARISON WITH OTHER RESULTS

Of the published research in this field which supports the hypothesis, two articles indicate which variables proved to be the most significant in the relationship. Doudna investigated unemployment, corporate profits and consumer sentiment, and reported the resulting multivariate model to be significant. Lenser and Green considered a wider range of economic variables, including GDP, Industrial Capacity Utilisation, Unemployment, Consumer Expectations, Retail Sales, Auto Sales and Housing construction data. The most significant variables in their model were GDP, unemployment and retail sales.

For the incidence rate experience the variables we finally included were the participation rate and total bankruptcies. The participation rate encapsulates various features of the labour market. This indicates that employment conditions appear to have a strong influence on the level of disability. These results are broadly consistent with those of Doudna, and Lenser and Green who found the unemployment rate to be a significant variable in their respective models.

As expected there is a strong correlation between total bankruptcies and GDP. It may, therefore, be the case that for this data, although the bankruptcy rate proved to allow the best fit, GDP may also be a reliable predictor for disability on the basis of its 0.86 correlation with bankruptcies. If this is true, then these results are consistent with those of Lenser and Green.

The model of claim duration for 2 week deferment period used long-term unemployment and the bankruptcy rate. The only results that this can be compared with are those of Lenser and Green who investigated both claim frequency and claim duration. They indicated that the most significant variables in the model were GDP, unemployment and retail sales. Given the correlation between bankruptcies and GDP this indicates consistency between our results and that of Lenser and Green. We did not attempt to fit retail sales data.

Of particular interest in our model is the inclusion of total bankruptcies. Lenser and Green believed that small business bankruptcies "might tie closely to disability statistics for the population typically insured under individual disability policies". It is unfortunate that they were not able to obtain a sufficient historical series of small business bankruptcy data to include in their model. It would be interesting to compare the results if small business bankruptcies were analysed by Lenser and Green and proved to be a significant variable in their model.

The model for claim duration with 1 month deferment period consisted of only one predictor variable – long-term unemployment. This is consistent with Lenser and Green's inclusion of unemployment in their model of claim durations.

There has been no other published statistical analysis of the relationship between the number of recipients of disability pensions and the economy. Landt and Pech have attributed the growth in disability pension receipt to three main factors: First, the increase in unemployment during the 1980's and the "selective impact on groups such as middle-aged and older men from blue collar occupations", and more recently the impact of government policies and population ageing. Second, "the increase in long term unemployment and subsequent discouragement from job search" affecting the health of the unemployed population. Third, the declining availability of alternative payments for people aged over fifty. In Canada, the rising incidence of disability has also been attributed in part to the ageing population (Bunch and Crawford).

In the analysis of the number of disability support pension recipients in Australia the variables included were consumer confidence, GDP and total bankruptcies. While the interpretation of the results have a caution attached to them as described in section 7, the economic variables are generally consistent with the descriptive work of Landt and Pech.

9. ALTERNATIVE EXPLANATIONS

In the general literature on disability insurance there is extensive discussion of the impact of liberalisation of policy conditions and underwriting practices. De Ravin (1998)) gives a very typical list of issues. Woolfrey (1998) deals in some detail with the likely impact on observed experience from the change to an "own" occupation definition from an "any" definition and the inclusion of automatic increase in benefits during claim. He suggests an increase in both incidence rates and claim duration arising from the first of these issues and an increase in claim duration from the second issue.

For the hypothesis examined in this paper the crucial issue is whether the observed changes in incidence rates and claim durations for insured benefits could be adequately attributed, in whole or significant part, to the liberalization of policy conditions and underwriting.

In general, liberalisation has proceeded steadily over the whole period since 1974. Until very recently there was little real impetus for any retreat from the general trend. In respect to incidence rates the data, as shown in Table 3.4 and Figure 3.1, do not immediately lead to an obvious link between the rates and these changes in policy conditions and underwriting. While it is true that there was a steady increase from 1990 to 1994 the rates have shown a general decrease from the high point in 1983. Some would argue that the greatest liberalisation took place in the 1990 to 1994 period and that the observed experience is a direct result.

While this may be a reasonable observation there is no quantitative evidence to support it. Liberalisation will manifest itself at the individual company level. The published experience data consistently shows almost extreme variations among individual companies e.g. the 1997 Disability Committee Report shows a variation in incidence rate experience from 67% to 130% where the aggregate industry experience was 100%. Liberalisation will also take place at a different pace in different companies so that any impact of the aggregate industry experience will take some time to manifest. It may also be that the early liberalisers will have retreated somewhat as the late liberalisers are just starting.

However, it is obvious that changes in policy conditions and underwriting play some part in the variation of the observed experience. At this time there is no data with which to quantify the contribution. We do not believe that this alternative explanation is sufficient to invalidate the hypothesis of a significant correlation between incidence rates and economic conditions.

The data for claim durations as shown in Table 4.1 and Figures 4.1 exhibits a more pronounced steady increase over the period but, even here, there is evidence of a reduction in some years e.g. 2 week deferment from 1993 to 1995.

The statistical significance of the regression models was very high for the 2 week deferment but only moderate for the 1 month deferment. These results need to be treated with some caution because of the small amount of data on which the regression was based. As noted in respect to incidence rates, there is great variation between individual companies. For claim durations the extent of the variation is similar to that for incidence rates but the results are not necessarily correlated e.g. companies with a better experience for incidence do not always have a better experience for duration.

We draw the same conclusion for claim duration as for incidence. Changes in policy conditions and claims management practices have a material impact on the experience of claim durations. There is, currently, no way to quantify this impact and we believe that the claim durations are also significantly influenced by economic conditions.

In order to quantify the link between liberalisation and experience, data on changes in policy conditions and underwriting according to individual company would need to be available and the data for experience would be available on a much shorter time interval than the four or five year aggregates which have typically been published by the Disability Committee. While it is possible to envisage the collection of the data on changes in policy conditions, the experience data would need changes to the material collected and published by the Disability Committee. Full data, at a minimum on an annual basis, but desirably on a quarterly basis, would be required to demonstrate any significant statistical correlation between liberalisation and experience.

10. PREDICTIONS FOR 1996 TO 2000

The regression models derived in section 7 were used to predict the rates for each measure of disability.

Experience was predicted for each of the years 1996 to 2000. The predictions were then compared with such of the experience data as was available.

The predicted rates for 1996 to 2000 and the actual rates for 1993 to 1995 are shown in Table 10.1

Table 10.1: *Predicted Rates (1996 – 2000) and Actual Rates (1993 – 1995)*

Year	Incidence Rates Actual / Expected	Claim Duration (weeks) 2 weeks deferment	Claim Duration (weeks) 1 month deferment	Government Disability Pension % of Population 15-65
1993	0.63	106	129	3.45
1994	0.68	104	130	3.67
1995	0.65	102	133	3.86
1996	0.60	97	122	3.90
1997	0.67	105	123	4.17
1998	0.73	112	125	4.50
1999	0.75	114	123	4.96
2000	0.70	110	120	4.96

The interim reports of the Disability Committee only show abridged data. As a result the comparison of the predicted results with the actual results has been modified. The interim report shows the percentage change of the aggregate period 1995 to 1998 from the aggregate period 1993 to 1996 subdivided according to gender, deferment period and occupation class. This data has been converted to a single measure by weighting the individual cells according to the distribution of in force records as at 31/12/1995. For claim duration the increase in duration during the first 2 years of benefit period has been used to be consistent with the data used in this paper for claim duration for closed claims. Weights for gender and occupation class for claim durations are not available. We have, therefore, simply averaged the four Male occupation classes plus Female class A as an approximation to a true weighted average. To calculate the predicted changes in experience over the two periods compared in the interim report the data in Table 10.1 has been averaged to give a single measure for each period.

The comparison of predicted and actual changes for insured data is shown in Table 10.2

Table 10.2: *Comparison of Predicted and Actual Experience % Changes over the Period 1993-1996 to 1995-1998*

	Incidence	Claim Duration 2 weeks deferment	Claim Duration 1 month deferment
Predicted	0.0	1.7	(2.1)
Actual	3.0	15.8	18.0

In interpreting these results the confidence intervals of the predicted numbers need to be considered. In the case of incidence rates and 2 week claims durations the 95% interval is of the order of 10% either side of the estimates. For 1 month claim durations the 95% interval is around half this range. This would suggest that the observed incidence rates are consistent with the economic correlation hypothesis of this paper but that the claim durations are increasing at a faster rate than explained by changes in economic conditions alone. It may be that we are seeing evidence of the increases that Woolfrey suggested would be the outcome of changes in policy conditions.

It is also relevant that the regression models were based on a quite small data set and as a result, material variation from actual in the estimates may be expected.

The comparison of the predicted Government disability pension proportion and the actual figures is shown in Table 10.3

Table 10.3: *Comparison of Predicted and Actual % of Population 15-65 Receiving Government Disability Pension*

	1996	1997	1998	1999	2000
Predicted	3.90	4.17	4.50	4.96	4.96
Actual	4.04	4.22	4.37	4.50	4.63

While these results suggest a reasonable fit the cautions expressed in Sections 5.2 and 7.5 must be remembered.

Overall these results are supportive of the general hypothesis. If the predicted results for 2000 were to eventuate it would be good news for the industry!

11. CONCLUSIONS

Determining the relationship between disability and the economy is a subjective and complicated process. The economy is impossible to measure with a single index, and there is considerable debate regarding the contents of composite economic indicators. In addition the measurement of the level of disability is influenced by changes in the disability insurance market and classifications of government social security payments. As Lenser and Green commented “trying to find numerical correlations between economic statistics and disability statistics might be like trying to find the proverbial needle in the haystack”. While the general proposition of the dependence of disability experience on economic conditions is supported, the extent of the correlation and the detailed process which leads from economic conditions to disability claims are not, as yet, well understood.

Four sets of disability experience data were analysed and models of their regression against a range of economic variables were produced. The four sets of disability data were

- Insured incidence rates
- Insured claim durations – 2 week deferment
- Insured claim durations – 1 month deferment
- Government disability pensions

The statistical significance of the regression models were, respectively, High, Very High, Moderate and Very High.

Significant caution has been expressed in interpreting the results in respect to Government disability pensions.

Each of the economic variables included in the regression models have plausible qualitative reasons that explain the observed statistical correlations.

While it is clear that liberalisation of policy conditions and underwriting will impact the experience there is no data from which to draw quantitative conclusions. A qualitative review of the potential impact does not support a view that this liberalisation is the major explanation of the observed changes in experience.

The regression models developed in this paper produce estimates for years after 1995 which agree quite closely with actual incidence rates but are less reliable in predicting claim durations.

Extending this research to allow more sensitive analyses would require significant increases in the data available in respect to Government disability pensions and would require Disability Committee data to be available in detail for at least annual intervals if not quarterly. The availability of such data would then permit quantitative work on the impact of liberalisation and would allow much better understanding of the correlations between disability experience and economic conditions including the impact of any lag affect.

Notwithstanding the limitations imposed by the extent of the available data the results are, in the authors' opinion, credible evidence which supports the widely held view that disability experience is materially affected by economic conditions.

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APPENDIX A

ECONOMIC INDICATOR CORRELATIONS

The table below shows the complete correlation matrix of all economic indicators considered. The explanation of the V indicators follows.

	Economic Indicator		Economic Indicator
V6	Consumer Confidence	V19	Burglary
V7	Participation Rate	V20	Car Theft
V8	Unemployment	V21	Larceny
V9	Hours Worked	V22	Robbery
V10	Long Term Unemployment	V23	Manufacturing Production
V11	Job Vacancies	V24	Industrial Production
V12	New Passenger Vehicles	V25	Private Final Demand
V13	New Vehicles Other	V26	Private Non Farm Inventory
V14	Real GDP per Capita	V27	Household Savings Ration
V15	Change in Real GDP	V28	Terms of Trade
V16	Business Bankruptcy	V29	GPI
V17	Non business Bankruptcy	V30	Dwelling Approvals
V18	Total Bankruptcy	V31	Change in Dwelling Approvals

	V5	V6	V7	V8	V9	V10	V11	V12	V13	V14	V15	V16	V17	V18
V6	0.09	1.00	-0.43	0.13	-0.24	0.39	0.01	0.27	0.25	-0.16	0.41	-0.26	-0.22	-0.24
V7	0.76	-0.43	1.00	0.13	0.96	0.30	0.11	0.07	-0.63	0.91	0.05	0.65	0.85	0.82
V8	0.50	0.13	0.13	1.00	0.26	0.76	-0.76	-0.03	-0.45	0.36	-0.18	0.61	0.57	0.59
V9	0.86	-0.24	0.96	0.26	1.00	0.51	0.09	0.19	-0.59	0.98	0.16	0.63	0.88	0.84
V10	0.74	0.39	0.30	0.76	0.51	1.00	-0.26	0.18	-0.38	0.63	0.36	0.39	0.59	0.56
V11	-0.18	0.01	0.11	-0.76	0.09	-0.26	1.00	-0.02	0.24	0.03	0.39	-0.66	-0.34	-0.42
V12	0.29	0.27	0.07	-0.03	0.19	0.18	-0.02	1.00	0.53	0.21	0.39	0.10	0.08	0.09
V13	-0.61	0.25	-0.63	-0.45	-0.59	-0.38	0.24	0.53	1.00	-0.61	0.22	-0.64	-0.76	-0.75
V14	0.91	-0.16	0.91	0.36	0.98	0.63	0.03	0.21	-0.61	1.00	0.24	0.63	0.90	0.86
V15	0.21	0.41	0.05	-0.18	0.16	0.36	0.39	0.39	0.22	0.24	1.00	-0.26	-0.03	-0.08
V16	0.72	-0.26	0.65	0.61	0.63	0.39	-0.66	0.10	-0.64	0.63	-0.26	1.00	0.88	0.93
V17	0.91	-0.22	0.85	0.57	0.88	0.59	-0.34	0.08	-0.76	0.90	-0.03	0.88	1.00	0.99
V18	0.88	-0.24	0.82	0.59	0.84	0.56	-0.42	0.09	-0.75	0.86	-0.08	0.93	0.99	1.00
V19	0.78	-0.16	0.76	0.61	0.87	0.71	-0.16	0.08	-0.59	0.88	0.04	0.62	0.85	0.81
V20	0.30	-0.44	0.62	0.19	0.61	0.29	0.25	-0.33	-0.51	0.59	-0.02	0.16	0.47	0.41
V21	0.84	-0.23	0.87	0.50	0.92	0.65	-0.10	-0.04	-0.76	0.94	0.10	0.69	0.93	0.89
V22	0.95	-0.01	0.78	0.58	0.89	0.70	-0.26	0.28	-0.59	0.92	0.05	0.76	0.93	0.91
V23	0.85	-0.17	0.93	0.16	0.98	0.48	0.18	0.17	-0.58	0.96	0.21	0.56	0.83	0.79
V24	0.91	-0.19	0.93	0.38	0.99	0.60	-0.02	0.19	-0.63	0.99	0.15	0.69	0.93	0.89
V25	0.76	-0.10	0.82	0.01	0.84	0.25	0.14	0.21	-0.49	0.79	0.08	0.56	0.71	0.69
V26	-0.84	0.09	-0.76	-0.57	-0.89	-0.79	0.05	-0.06	0.62	-0.93	-0.20	-0.55	-0.84	-0.79
V27	-0.89	0.20	-0.87	-0.50	-0.94	-0.67	0.09	0.00	0.76	-0.96	-0.10	-0.69	-0.94	-0.90
V28	-0.55	-0.13	-0.21	-0.56	-0.31	-0.70	0.20	0.19	0.56	-0.45	-0.24	-0.25	-0.47	-0.43
V29	0.75	-0.46	0.94	0.29	0.92	0.34	-0.14	0.22	-0.51	0.88	-0.02	0.78	0.88	0.87
V30	-0.04	0.62	-0.24	-0.16	-0.16	0.10	0.17	0.17	0.23	-0.16	0.38	-0.18	-0.23	-0.22
V31	-0.06	0.49	-0.21	0.25	-0.14	0.24	-0.12	-0.33	-0.20	-0.14	0.08	0.00	-0.04	-0.04



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	V19	V20	V21	V22	V23	V24	V25	V26	V27	V28	V29	V30	V31
V6	-0.16	-0.44	-0.23	-0.01	-0.17	-0.19	-0.10	0.09	0.20	-0.13	-0.46	0.62	0.49
V7	0.76	0.62	0.87	0.78	0.93	0.93	0.82	-0.76	-0.87	-0.21	0.94	-0.24	-0.21
V8	0.61	0.19	0.50	0.58	0.16	0.38	0.01	-0.57	-0.50	-0.56	0.29	-0.16	0.25
V9	0.87	0.61	0.92	0.89	0.98	0.99	0.84	-0.89	-0.94	-0.31	0.92	-0.16	-0.14
V10	0.71	0.29	0.65	0.70	0.48	0.60	0.25	-0.79	-0.67	-0.70	0.34	0.10	0.24
V11	-0.16	0.25	-0.10	-0.26	0.18	-0.02	0.14	0.05	0.09	0.20	-0.14	0.17	-0.12
V12	0.08	-0.33	-0.04	0.28	0.17	0.19	0.21	-0.06	0.00	0.19	0.22	0.17	-0.33
V13	-0.59	-0.51	-0.76	-0.59	-0.58	-0.63	-0.49	0.62	0.76	0.56	-0.51	0.23	-0.20
V14	0.88	0.59	0.94	0.92	0.96	0.99	0.79	-0.93	-0.96	-0.45	0.88	-0.16	-0.14
V15	0.04	-0.02	0.10	0.05	0.21	0.15	0.08	-0.20	-0.10	-0.24	-0.02	0.38	0.08
V16	0.62	0.16	0.69	0.76	0.56	0.69	0.56	-0.55	-0.69	-0.25	0.78	-0.18	0.00
V17	0.85	0.47	0.93	0.93	0.83	0.93	0.71	-0.84	-0.94	-0.47	0.88	-0.23	-0.04
V18	0.81	0.41	0.89	0.91	0.79	0.89	0.69	-0.79	-0.90	-0.43	0.87	-0.22	-0.04
V19	1.00	0.71	0.93	0.89	0.81	0.90	0.58	-0.96	-0.91	-0.42	0.80	-0.23	0.03
V20	0.71	1.00	0.71	0.45	0.55	0.57	0.21	-0.70	-0.62	-0.35	0.52	-0.51	-0.12
V21	0.93	0.71	1.00	0.87	0.88	0.94	0.65	-0.94	-0.98	-0.52	0.84	-0.20	0.04
V22	0.89	0.45	0.87	1.00	0.84	0.92	0.71	-0.89	-0.90	-0.47	0.81	-0.22	-0.12
V23	0.81	0.55	0.88	0.84	1.00	0.97	0.90	-0.84	-0.92	-0.28	0.86	-0.03	-0.07
V24	0.90	0.57	0.94	0.92	0.97	1.00	0.83	-0.91	-0.97	-0.37	0.91	-0.12	-0.07
V25	0.58	0.21	0.65	0.71	0.90	0.83	1.00	-0.59	-0.74	-0.01	0.76	0.14	-0.01
V26	-0.96	-0.70	-0.94	-0.89	-0.84	-0.91	-0.59	1.00	0.95	0.57	-0.75	0.20	0.00
V27	-0.91	-0.62	-0.98	-0.90	-0.92	-0.97	-0.74	0.95	1.00	0.53	-0.84	0.16	-0.01
V28	-0.42	-0.35	-0.52	-0.47	-0.28	-0.37	-0.01	0.57	0.53	1.00	-0.15	0.27	0.07
V29	0.80	0.52	0.84	0.81	0.86	0.91	0.76	-0.75	-0.84	-0.15	1.00	-0.24	-0.24
V30	-0.23	-0.51	-0.20	-0.22	-0.03	-0.12	0.14	0.20	0.16	0.27	-0.24	1.00	0.69
V31	0.03	-0.12	0.04	-0.12	-0.07	-0.07	-0.01	0.00	-0.01	0.07	-0.24	0.69	1.00



APPENDIX B

DETAILS OF THE REGRESSION MODELS

B.1 Incidence Rates

Coefficients:

	Value	Std. Error	t value	Pr(> t)
(Intercept)	5.9345	1.3069	4.5408	0.0006
Participation Rate	-0.0871	0.0218	-3.9909	0.0015
Total Bankruptcies	0.1741	0.0813	2.1416	0.0517

Residual standard error: 0.0548 on 13 degrees of freedom

Multiple R-Squared: 0.6043

F-statistic: 9.925 on 2 and 13 degrees of freedom, the p-value is 0.002416

B.2 Claim Durations – 2 weeks

Coefficients:

	Value	Std. Error	t value	Pr(> t)
(Intercept)	32.3238	9.3797	3.4462	0.0137
Long Term Unemployment	1.2074	0.3683	3.2781	0.0169
Total Bankruptcies	24.8547	7.3754	3.3700	0.0150

Residual standard error: 4.435 on 6 degrees of freedom

Multiple R-Squared: 0.8858

F-statistic: 23.27 on 2 and 6 degrees of freedom, the p-value is 0.001489

B.3 Claim Durations – 1 month

Coefficients:

	Value	Std. Error	t value	Pr(> t)
(Intercept)	89.1496	11.4605	7.7789	0.0001
Long Term Unemployment	1.1197	0.3870	2.8936	0.0232

Residual standard error: 5.475 on 7 degrees of freedom

Multiple R-Squared: 0.5447

F-statistic: 8.373 on 1 and 7 degrees of freedom, the p-value is 0.0232

B.4 Government Disability Pensions

Coefficients:

	Value	Std. Error	t value	Pr(> t)
(Intercept)	-0.0301	0.0075	-4.0081	0.0017
Consumer Confidence	0.00012	0.000028	4.5827	0.0006
Real GDP per Capita	0.0000019	0.0000004	4.5351	0.0007
Total Bankruptcies	0.0081	0.0022	3.7399	0.0028

Residual standard error: 0.0002184 on 12 degrees of freedom

Multiple R-Squared: 0.9551

F-statistic: 85.14 on 3 and 12 degrees of freedom, the p-value is 2.348e-008

