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Is Australian unemployment Keynesian or neo-classical?: a disequilibrium approach to unemployment

Trevor Steven Coombes

University of Wollongong
IS AUSTRALIAN UNEMPLOYMENT KEYNESIAN OR NEO-CLASSICAL?:
A DISEQUILIBRIUM APPROACH TO UNEMPLOYMENT

A Thesis submitted in fulfilment of the requirements for the award of the degree of

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By

Trevor Steven Coombes
Bachelor of Arts (Economics)
Diploma of Education (Secondary)
IS AUSTRALIAN UNEMPLOYMENT KEYNESIAN OR NEO-CLASSICAL?:

A DISEQUILIBRIUM APPROACH TO UNEMPLOYMENT
Thanks to my supervisor, Dr. John Mangan.

Special thanks to my good friends:

Dr. B Rao
Dr. Trivedi

Thanks to my immediate family, John Coombes, my brother, and my parents: Lucinda Coombes and Alfred Coombes.
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AUTHOR'S CERTIFICATION

I certify that the substance of this thesis has not already been submitted for any degree and is not being submitted currently for any other degree.

I certify that any help received in preparing this thesis and all sources used have been acknowledged.

[Signature]
Thanks to my supervisor Dr. John Mangan and Dr. P. Trivedi for graciously supplying me with some data.

A special thanks to Dr. B. Rao, University of N.S.W., for his kind assistance. Without his kindness this thesis would not have been possible.
ABSTRACT

The basic aim of this thesis is to investigate unemployment in Australia using a disequilibrium framework. In particular, involuntary unemployment is examined from both a Keynesian and a Classical perspective. As a consequence, both Classical and Keynesian doctrines were interpreted as disequilibrium theories called Neo-Classical and (New) Keynesian respectively. Examined within a (New) Keynesian (disequilibrium) theory an unambiguous definition of involuntary unemployment emerges. The Neo-Classical (disequilibrium) theory, unlike the Classical theory, also allows for bouts of involuntary unemployment. Consequently, a distinction between Neo-Classical and (New) Keynesian involuntary unemployment is considered a matter of degree rather than principle; if wages adjust more rapidly than employment toward equilibrium, then unemployment would be Neo-Classical. Furthermore, since involuntary unemployment is a disequilibrium concept, the unemployment model was estimated using a disequilibrium procedure. After reviewing the econometrics and theory of disequilibrium a generalized partial adjustment equation, developed by Chow (1983), was adopted. This procedure has distinct advantages over other techniques. The unemployment model was estimated for Australia over two periods: 1964 to 1972 for the first period and from 1972 to 1986 for the second period. It was found that neither period could be classified as either pure (New) Keynesian or Neo-Classical; however, there is evidence of elements of both theories in each period. This thesis also examined structural and search unemployment. Finally, evidence of labour dishoarding in period two was also found.
CHAPTER 1

INTRODUCTION

1.1 AUSTRALIA'S UNEMPLOYMENT: AN OVERVIEW

1.1.1 Extent of Australia's Unemployment

Observation of graph 1.1 indicates that unemployment in Australia has shown an upward trend since the 1960s, particularly after 1974. Registered unemployment peaked in 1983 at 10.7 per cent of the workforce (February), and has now settled at around the 8 per cent level. Over this time span two periods are worthy of special attention: 1974 (November) to 1978 (February) during which unemployment rates accelerated from 3.7 per cent to 7.5 per cent respectively and 1981 (February) to 1983 (February) in which unemployment rates rose from 6.3 per cent to 10.7 per cent.

Since peaking in 1985, the registered unemployment rate has settled at around the 8 per cent level. The labour market, however, has issued some confused signals over the significance of this level. A rate of 8 per cent, given post-war history, would seem abnormally high and indicative of depressed demand; however, Sloan (1985) and others are now speaking of 7 per cent unemployment as the true full employment level.

From an international perspective, Australia's unemployment rates have deteriorated over this period relative to the average unemployment rates for OECD countries. Whilst Australia was consistently below the OECD average before 1975, it has been, in general, consistently near or above the OECD average since 1975. This can be seen from Graph 1.2.

1.1.2 Dimensions of Unemployment

Traditionally as unemployment rises (a downturn in the trade-cycle), persons who are able to work may become discouraged and stop looking for work. Married women, for example, may stop searching for a job and stay at home. In other words participation rates and economic activity are, in general, positively related. Two implications are; that (i) employment and unemployment are not exact opposites and therefore
PERCENT UNEMPLOYED - AT MAY
(civilian population aged 15 years and over)

1985 (May) - 1985 (June) - The Labour Force, Australia, A.B.S.,
Catalogue no. 6203.
Table 1.1: Labour Force Unemployment Rates (a) for Selected OECD Countries 1972-1986 (Per cent)

<table>
<thead>
<tr>
<th>Year(b)</th>
<th>Australia</th>
<th>USA</th>
<th>Canada</th>
<th>Japan</th>
<th>France</th>
<th>Germany</th>
<th>Italy</th>
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<td>0.7</td>
<td>3.4</td>
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<td>2.3</td>
<td>4.9</td>
<td>5.5</td>
<td>1.3</td>
<td>2.7</td>
<td>0.7</td>
<td>3.2</td>
<td>2.5</td>
<td>3.2</td>
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<td>2.7</td>
<td>5.6</td>
<td>5.3</td>
<td>1.4</td>
<td>2.9</td>
<td>1.6</td>
<td>2.8</td>
<td>2.0</td>
<td>3.1</td>
</tr>
<tr>
<td>1975</td>
<td>4.8</td>
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<td>5.7</td>
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<tr>
<td>1977</td>
<td>5.6</td>
<td>6.9</td>
<td>8.0</td>
<td>2.0</td>
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<td>3.6</td>
<td>7.0</td>
<td>1.8</td>
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<td>1978</td>
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<td>6.0</td>
<td>8.3</td>
<td>2.2</td>
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<td>3.5</td>
<td>7.1</td>
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<td>6.0</td>
</tr>
<tr>
<td>1979</td>
<td>6.2</td>
<td>5.8</td>
<td>7.4</td>
<td>2.1</td>
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<td>3.2</td>
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<td>2.1</td>
<td>5.1</td>
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<td>1980</td>
<td>6.0</td>
<td>7.0</td>
<td>7.4</td>
<td>2.0</td>
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<td>3.0</td>
<td>7.5</td>
<td>2.0</td>
<td>6.6</td>
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<tr>
<td>1981</td>
<td>5.7</td>
<td>7.5</td>
<td>7.5</td>
<td>2.2</td>
<td>7.3</td>
<td>4.4</td>
<td>8.3</td>
<td>2.5</td>
<td>9.9</td>
</tr>
<tr>
<td>1982</td>
<td>7.1</td>
<td>9.5</td>
<td>10.9</td>
<td>2.4</td>
<td>8.1</td>
<td>6.1</td>
<td>9.0</td>
<td>3.1</td>
<td>11.4</td>
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<tr>
<td>1983</td>
<td>9.9</td>
<td>9.5</td>
<td>11.8</td>
<td>2.6</td>
<td>8.3</td>
<td>8.0</td>
<td>9.8</td>
<td>3.5</td>
<td>12.6</td>
</tr>
<tr>
<td>1984</td>
<td>8.9</td>
<td>7.4</td>
<td>11.2</td>
<td>2.7</td>
<td>9.7</td>
<td>8.5</td>
<td>10.2</td>
<td>3.1</td>
<td>13.0</td>
</tr>
<tr>
<td>1985</td>
<td>8.2</td>
<td>7.1</td>
<td>10.4</td>
<td>2.6</td>
<td>10.1</td>
<td>8.6</td>
<td>10.5</td>
<td>2.8</td>
<td>13.2</td>
</tr>
<tr>
<td>1986</td>
<td>7.9</td>
<td>7.0</td>
<td>9.7</td>
<td>2.6</td>
<td>10.0</td>
<td>8.4</td>
<td>10.9</td>
<td>2.8</td>
<td>13.1</td>
</tr>
</tbody>
</table>

OECD Main Economic Indicators, 1986. p.18

Graph 1.2: Comparative Unemployment Rates
Constructed from above table

Average Annual Unemployment Rate (%)
one cannot equate an increase in unemployment with a reduction in employment, and (ii) that the discouraged worker effect reduces the labour supply. Varying participation rates, independent of economic activity, may provide, in part, an exogeneous explanation of the variation of the unemployment rate. Unemployment rates may therefore be higher than official data will suggest.

 Gregory (1984) argues that the traditional relationship between economic activity and the participation rate had not always held in Australia during the seventies. He states: "during the seventies the rate at which people entered and left the labour force in response to job opportunities became more volatile. The large increase in [registered] unemployment during 1974-75, for example, now seems to be not so much due to the rate of job loss, that was exceptional for a recession, but to the exceptional behaviour of the labour force participation rate. When faced with deteriorating job prospects during 1974, workers did not leave the labour force at the same rate as in earlier recessions. Consequently, [registered] unemployment increased more quickly by a larger amount" (Gregory 1984, p13-14). A similar experience occurred in 1979. This phenomenon has been illustrated in the Gregory and Duncan (1979) thesis, where they compared withdrawal and entry to the labour force in the 1951 recession with the 1974-75 recession (Gregory 1984, p13-14). As well as a change in the level of the participation rate, there has also been a change in the composition of the participation rate. Table 1.2 highlights this development.

 The proportion of the total labour force comprised of married females has increased consistently since the 1960s. As Mitchell (1984, p5) points out: "Australia's labour force exhibits two characteristics found in other English-speaking countries: declining male participation rates and rising female participation rates".

 According to Mangan and Stokes (1984, p40,41), available data suggest that females and particularly married females dominate the stock of discouraged workers. Moreover, the discouraged female worker is likely to be aged over 25 years. To be registered as unemployed, a person must be actively seeking employment.
TABLE 1.2: Labour Force Participation Rates

<table>
<thead>
<tr>
<th>Year at August</th>
<th>Males</th>
<th>All Females</th>
<th>Married Females</th>
<th>Persons</th>
</tr>
</thead>
<tbody>
<tr>
<td>1966</td>
<td>84.0</td>
<td>36.3</td>
<td>29.0</td>
<td>59.9</td>
</tr>
<tr>
<td>1973</td>
<td>82.1</td>
<td>41.4</td>
<td>39.0</td>
<td>61.6</td>
</tr>
<tr>
<td>1982</td>
<td>76.6</td>
<td>43.9</td>
<td>42.1</td>
<td>60.1</td>
</tr>
<tr>
<td>1986</td>
<td>75.9</td>
<td>43.7</td>
<td>43.1</td>
<td>60.1</td>
</tr>
<tr>
<td>Absolute change from 1966-86</td>
<td>-8.1</td>
<td>+7.4</td>
<td>+14.1</td>
<td>+0.2</td>
</tr>
</tbody>
</table>

Defined as the percentage ratio of the labour force to the population aged 15 years and over.

Source: The Labour Force Australia, ABS, Catalogue No. 6203

Discouraged workers are often referred to as hidden unemployment. "At August 1979 a total of 373,800 persons were registered unemployed, while Stricker and Sheehan (1981) estimate that a further 353,000 persons were hidden unemployed" (Mangan and Stokes, 1984, p38). More recent figures, according to Mangan and Stokes (1984, p23), indicate that "close to one million persons or 15 per cent of the total labour force (at May 1982)", would have been unemployed, if all dimensions of unemployment had been considered.

It can therefore be seen that participation rates exert an influence on the unemployment rate. The discouraged worker effect, if not considered, may lead to significant underestimation of unemployment levels. This is indicative of segmentation in the labour market. Whitfield (1986, p119-122), has cited a number of studies which identify significant areas of segmentation and disadvantaged groups for the Australian labour market. Moreover, Watkins (1986, p14-15) cites a number of authors who argue "that the jobs into which students enter are divided into institutionally and technologically discrete segments. Such a phenomenon has been noted in Australia by Gilmour and..."
Landsbury (1978)... On a broader scale, Windschuttle (1979) argues that the trend in Australia is toward a segmented labour market."

1.1.3 **Incidence of Unemployment**

Since the 1960s three groups exhibited above-average unemployment rates; females, older males and teenagers. Whilst registered unemployment rates for females have approached equality with those of males at around 8 per cent in 1987, there is considerable evidence to suggest that females suffer disproportionately high rates of hidden unemployment and underemployment. Underemployment is where workers receive fewer hours than they desire. It is perhaps to be expected that females, particularly married females, would feature prominently in hidden unemployment, as unemployed married females have no monetary incentive to register as unemployed. Merrilees (1982a) has shown that, of the total number listed in the Australian Bureau of Statistics (ABS) surveys of discouraged workers, over 75 per cent on average are females. The occupational distribution of women, resulting from both demand and supply side factors, with its high incidence of part-time work, makes underemployment an inevitable problem. Analysis of A.B.S data on involuntary short-time working shows that teenage females are the group most affected by underemployment (Mangan and Stokes 1984, p43, 45).

Older males and older persons in general do not have overly high registered unemployment rates, but there is considerable evidence of hidden unemployment amongst older males. Merrilees (1982b) has documented the "exodus from the workforce" that occurred in the early 1980s amongst older males. Whether this exodus was caused by the discouraged worker effect, or induced on the supply side by pensions and other social welfare payments, is in dispute. What is unquestioned however, is that if all those older males who left the workforce prematurely returned, the registered unemployment rate for older males would be much higher.

Stricker and Sheehan (1978, p15) have shown that the teenage rate of registered unemployment has often been relatively high: "Even as far back as 1954, the rate of
unemployment for teenagers was 1.7 times that of adults. There are a number of reasons for this connected with both demand and supply aspects. On the supply side, teenagers, particularly early school leavers, have little formal human capital and little or no work experience. In addition, the reduction in employment opportunities in manufacturing during the 1970's restricted the traditional ports of entry for unskilled youth. There is also evidence that employees are substituting married females for youth, which may in part be due to the traditional job search behaviour of youth, and its consequent effect on labour turnover. Rice (1986) in her work on juvenile unemployment in Britain, found that failure to achieve initial entry into the labour market was a serious problem for young school leavers and one which disadvantaged them in the long term. Miller and Volker (1987) have also found similar evidence for Australia.

1.2 THE SOCIAL AND ECONOMIC COSTS OF UNEMPLOYMENT

1.2.1 Social Costs of Unemployment

An enormous amount of literature exists today on unemployment which contains various views on causes and policy prescriptions. Often many papers assume its importance. This section will briefly demonstrate, not assume, that unemployment does matter and any investigation that may shed light on its causes and cures is worth pursuing. In both social and economic dimensions unemployment is a problem.

As Tomlinson (1983, p45) points out, the link between unemployment and poverty was perhaps first subject to rigorous study by Rowntree in England in 1936. He states: "that 1930's unemployment was the major cause of poverty and was shown in Rowntree's study of York in 1936 and the New Survey of London in the early 1930's". According to Smith (1984), unemployment is perhaps the major factor contributing to the numbers placed in poverty. There are further social ramifications of unemployment on the physical and mental health of those unemployed.

Smith (1984, p125), citing a 1975 study by the Victorian Mental Health Authority, "showed that the rate of attempted suicide among the unemployed (in Ballarat)
was more than twelve times the average area rate". In the Blacktown area of New South Wales the salient feature of those attempting suicide was unemployment. A recent paper presented to the University of Wollongong by Ahlburg (1984) reflects similar findings. Ahlburg (1984, p10), citing a study by Martina (1984) of the Australian National University, reported a "positive association between unemployment and suicide rates for males 15-29 years with males 20-24 most sensitive to unemployment [and]...found a positive correlation between the unemployment rate and the percentage of male deaths attributable to suicide for the period 1966-1980 (significant at the .05 level)". Ahlburg (1984, p3) further cites a study conducted in conjunction with Schapiro (1982-83); they "found that a one per cent increase in the United States unemployment rate in 1980 led to an additional 320 suicides". It has been assumed thus far that despair is a consequence of being unemployed for long periods. Viney (1984) in her article 'The Psychological and Social Effects of Unemployment', however, cites numerous studies linking many adverse psychological states with unemployment. Many of these studies linked unemployment with various states of anxiety, such as shame, guilt, loneliness, helplessness and depression; as Viney (1984, p135) states, the "most important of all, and that which many underlie all these other [states], is alienation."

In respect to physical health Smith (1984) states that "the deterioration of diet (through poverty) combined with general depression means that some unemployed and their children are particularly prone to illness. A study undertaken in Birmingham indicated that parental unemployment doubled the risk of a child's admission to hospital (generally with an infectious disease). Brunn and Drane at Macquarie University also showed a strong association between ischaemic heart disease, mortality and unemployment" (Smith, 1984, p125).

The reader should, however, be aware of the tenuous statistical links between unemployment, health and poverty. Both Tomlinson (1983) and Ahlburg (1984) address the writings of Ian Stern. Tomlinson (1983, p36), in citing Stern (1981), writes: "the inter-relationship between the incidence of poverty, unemployment, low earnings, high mortality and high morbidity rates makes it very difficult to disentangle the effect of
unemployment from the effects of other variables on morbidity and mortality rates." Ahlburg (1984, p3) also writes: "Stern (1983) has recently argued 'that there is no reliable evidence, as yet, in favour of the view that unemployment is the major determinant of morbidity and/or mortality', since it is not possible to establish the direction of causality. In fact [Stern (1983)] argues that the incidence of ill-health and unemployment are both strongly affected by [other] underlying socio-economic factors."

As demonstrated in the previous section, however, unemployment does not fall proportionately on those in the labour market. Those who are in disadvantaged or weak positions in the labour market are more prone to be unemployed. Thus, as Tomlinson (1983, p36) points out, unemployment "may serve to reinforce as much as cause a pattern of low income" and ill-health.

Another problem of being unemployed is, as Tomlinson (1983) argues, the de-politicisation of those persons out of work, as it deprives them of the resources, such as unions, income and knowledge, which are a necessary pre-condition for political activity. The de-politicisation, coupled with the alienation of the unemployed, may damage social and political order. Dwyer and Wilson (1981) "found evidence of increased social tension among the unemployed inner city youth" (in Ahlburg, 1984, p10). Tomlinson (1983) cites Hitler's rise to power in Germany when the level of mass unemployment (30%) was on a scale never experienced by Britain. Tomlinson (1983) points out, however, quite rightly, that Hitler's rise to power was due to many other important factors. This paper does not wish to overstate the social and political dissent caused by unemployment, but merely wishes to make the point that perhaps other subtle social changes are underfoot.

Indeed the increase in crime associated with increased unemployment is a manifestation of anti-social behaviour. Ahlburg (1984, p10), citing the Yearbook of Australia (1983), found that a parallel rise in crime occurred over the period 1971-72 to 1980-81, "even though the prime crime group (males 15-24 years) remained relatively constant at about 9 per cent of the population over this period." Smith (1984, p126) states that "perhaps one of the most significant research studies was that done by the
South Australian Working Party into Unemployment (May, 1976) which showed the percentage increase for several classes of offenders in the period June 1973-76.

### TABLE 1.3 Percentage Increase in Crime by Class

<table>
<thead>
<tr>
<th>Age 14 to 18</th>
<th>Increase</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total offenders</td>
<td>58%</td>
</tr>
<tr>
<td>School-attending offenders</td>
<td>40% (approx.)</td>
</tr>
<tr>
<td>Workforce employed offenders</td>
<td>37%</td>
</tr>
<tr>
<td>Workforce unemployed offenders</td>
<td>238%</td>
</tr>
</tbody>
</table>


Heeding Stern's point about causality, this paper does not wish to overstate the causation between unemployment and criminalization. Indeed, increasing crime could well be inherent in the youth of Western cultures and as such may be the third variable correlating rising crime and unemployment; however, if crime among unemployed youth is rising faster than non-unemployed youth, then unemployment is at least a reinforcing factor in the rising crime rate. The study by the South Australian Working Party seems to bear this out. The increase in crime for unemployed offenders was significantly greater than that for non-unemployed offenders (school attenders and employed offenders).

The conclusion is that the goal of reducing unemployment is socially desirable. Reduced unemployment is not a panacea, but certainly the attainment of full employment facilitates an improvement in the effectiveness of many socially desirable welfare objectives. For example, the tasks of anti-discrimination Boards would be more effective during a period of full employment because periods of high unemployment allow employers more easily to rationalize discrimination in employment policies. Also, a reduction in unemployment benefits (not necessarily the rate per person) and an increase
in tax revenue not only removes an economic constraint on growth, but also releases more funds to finance both economic and social schemes. The opportunity costs of unemployment would also appear to be significant.

1.2.2 The Economic Costs of Unemployment

Studies in the United Kingdom (1981) of the economic costs of unemployment have shown a major impact on the United Kingdom's budget. Most careful estimates, according to Tomlinson (1983, p387), suggest "that the budgetary impact of 2.88 million unemployed was approximately £13 billion. As an indication of the magnitudes of lost output, the Manpower Services Commission estimated that starting from a base level of 700,000 [unemployed], each 100,000 extra unemployed people cost £590 million of output forgone. Thus, the loss to the national economy of 3 million unemployed would be of the order of £13.6 billion of output."

Estimates of forgone output for Australia have been conducted by Kalisch (1982) and Gruen and Chapman (1984), who revised Kalisch's investigation. They both found significant output losses due to unemployment. Potential Output (PO), from which foregone output is calculated, was derived by the formulae:

\[ PO = GDP \left[ 1 + b(u - F) \right] \]  

(1)

where GDP denotes gross domestic product, \( u \) is the unemployment rate and \( b \) is Okun's Law coefficient:

"In 1962 Okun argued that a decrease of one percentage point in the unemployment rate in the United States would lead to an increase in G.N.P. of 3.2 per cent " (Kalisch 1982, p1). This observed relationship between employment and output became known as Okun's Law. Using a time-series econometric approach, Kalisch (1982, p10) estimated Okun's Law coefficient \( b \) for Australia to be 2.748; a reduction of one percentage point in unemployment would yield a gain in output of 2.748 per cent.

The full employment rate is denoted by \( F \) with the residual unemployment described as the natural rate of unemployment (NRU). The NRU is the residual unemployment that exists when the labour market is in equilibrium (i.e. labour demand
and labour supply intersect). The residual unemployment is those persons currently moving between jobs. They are frictionally unemployed and are traditionally considered to be voluntarily unemployed. Structural unemployment, a mismatch in labour skills supplied and demanded, is often thought of as part of the NRU.

Presented below is a table of forgone output for Australia during the eighties, for various arbitrarily-chosen levels of F(NRU). In the construction of this table Kalisch's (1982) estimate of the Okun's Law coefficient was retained and applied to recent ABS data. Both forgone and potential output are presented in Table 1.4. Output losses are significant at each level of NRU. Even when the NRU is assumed to be 6.0 per cent the total loss in GDP (average 1979/80 prices) for the period 1980-86 (at June) is approximately $9.253 million. Interestingly when the NRU is 6.0 per cent, potential and actual GDP in 1980 virtually coincide, while in 1981 the economy's output exceeded its potential level.

Smith (1984, p120) also states that "with an average rate of unemployment of 450,000 persons [the level for Australia in 1982] we can expect to lose about $900 million in tax revenue, and another $1200 million or so in unemployment benefits." Finally, the long term ramifications of persistently high levels of unemployment, while in part being a manifestation of poor structural change, may in turn, tend to make the economy less receptive to changes in consumption and production techniques. For example, it becomes increasingly difficult for firms in a climate of persistent high levels of unemployment, to adopt labour-saving capital perhaps due to union pressure.

It has been demonstrated that a persistently high level of unemployment is both socially and economically undesirable in terms of costs to the individual and society. Unemployment does matter and its reduction is a fruitful policy to pursue. If the designers of policy do not consider the social costs of unemployment, then the potential benefits of a policy designed to reduce unemployment will be underestimated.
### TABLE 1.4 Forgone Output for Australia at June 1980-1986

(GDP $mill. at 1979/80 average prices)

<table>
<thead>
<tr>
<th>June</th>
<th>GDP $mill</th>
<th>Natural Rate of Unemployment (NRU) (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1980</td>
<td></td>
<td></td>
</tr>
<tr>
<td>June</td>
<td>2.0</td>
<td>4.0</td>
</tr>
<tr>
<td>1980</td>
<td>GDP</td>
<td>28636</td>
</tr>
<tr>
<td></td>
<td>PO</td>
<td>31862</td>
</tr>
<tr>
<td></td>
<td>Forgone Output</td>
<td>3226</td>
</tr>
<tr>
<td>1981</td>
<td>GDP</td>
<td>29880</td>
</tr>
<tr>
<td></td>
<td>PO</td>
<td>32508</td>
</tr>
<tr>
<td></td>
<td>Forgone Output</td>
<td>2628</td>
</tr>
<tr>
<td>1982</td>
<td>GDP</td>
<td>30079</td>
</tr>
<tr>
<td></td>
<td>PO</td>
<td>33881</td>
</tr>
<tr>
<td></td>
<td>Forgone Output</td>
<td>3802</td>
</tr>
<tr>
<td>1983</td>
<td>GDP</td>
<td>29607</td>
</tr>
<tr>
<td></td>
<td>PO</td>
<td>36116</td>
</tr>
<tr>
<td></td>
<td>Forgone Output</td>
<td>6509</td>
</tr>
<tr>
<td>1984</td>
<td>GDP</td>
<td>32036</td>
</tr>
<tr>
<td></td>
<td>PO</td>
<td>38110</td>
</tr>
<tr>
<td></td>
<td>Forgone Output</td>
<td>6074</td>
</tr>
<tr>
<td>1985</td>
<td>GDP</td>
<td>33659</td>
</tr>
<tr>
<td></td>
<td>PO</td>
<td>39486</td>
</tr>
<tr>
<td></td>
<td>Forgone Output</td>
<td>5827</td>
</tr>
<tr>
<td>1986</td>
<td>GDP</td>
<td>33979</td>
</tr>
<tr>
<td></td>
<td>PO</td>
<td>39115</td>
</tr>
<tr>
<td></td>
<td>Forgone Output</td>
<td>5136</td>
</tr>
</tbody>
</table>

June '80 to June '86 Total Forgone Output: $mill. 33202 21228 9253

b = 2.748

Constructed from data in:
1980-84, A.B.S. Time Series Data, Cat. No. 1311
1985-86(2) A.B.S. Labour Force Australia, Cat. No. 6202
and National Income and Expenditure Cat. No. 5206.
1.3 **OBJECTIVES: AN OVERVIEW**

The aim of this study is to disaggregate registered unemployed into its various types according to the causes of unemployment. Unemployment may arise due to insufficient output, excessive real wages, structural and search factors. Isolating the causes of unemployment is directly relevant to policy formulation. The paper adopts a non-à-tâtonnement (i.e. without-auctioneer) approach.

Economic theory can be dichotomized into two broad levels as depicted below. Equilibrium theory traditionally revolves around the Walrasian auctioneer where exchange in the market place (trade) occurs only when the market-clearing (equilibrium) prices are determined by an overseer. This analysis is most appropriate in markets such as the stock exchange, where trade occurs when supply and demand curves intersect. Underlying non-à-tâtonnement theory is the premise that an overseer or Walrasian auctioneer does not exist.

**DIAGRAM 1.1**

**Dichotomy of Economic Theory**

```
Non-à-tâtonnement  Equilibrium
(without auctioneer) (Walrasian)
```

```
Static  Dynamic
Disequilibrium  Disequilibrium
(steady-state equilibrium: SSE)
```

Consequently, trade may occur in disequilibrium, where supply and demand curves do not intersect; trade may occur at above or below equilibrium prices. In the Walrasian market no trade occurs until equilibrium prices are found. The time that elapses during the à-tâtonnement process is not real economic time. A modern version of the Walrasian system is the re-contracting process, where contracts are agreed upon if prices are equilibrium prices; if they are not, then traders re-contract after renegotiating. The point is that without an auctioneer, prices do not instantaneously adjust to market
disequilibrium. In other words, in the non-tâtonnement process, as Keynes highlights, quantities are a significant source of adjustment.

Underlying the principle that trade occurs in disequilibrium is the concept of dynamics. Disequilibrium implies dynamics, but as Hey (1981) points out, this implies non-optimal behaviour. As a result, models where disequilibrium prices are assumed to be fixed have evolved in the literature of disequilibrium. Although they are static disequilibrium models, they are described as being in a steady-state and hence in equilibrium (SSE). It will be demonstrated that the assumption of non-tâtonnement in the labour market and the ensuing theory is an appropriate framework for the study of unemployment.

The non-tâtonnement approach stems from the proposition that at least part of registered unemployment is a disequilibrium phenomenon. In other words, there are persons who are involuntarily unemployed; regardless of wage movements, labour may not be able to find work due to insufficient vacancies. This is an elusive concept, but it will be demonstrated that the elusive nature of this term can be overcome within a disequilibrium model. Consequently, the specification and estimation procedure adopted by this paper will reflect the disequilibrium nature of the labour market.

Given that non-tâtonnement trade underlies unemployment, then an estimation procedure which assumes that markets clear is logically inconsistent. This thesis discusses various non-tâtonnement estimation procedures. Since the thesis is attempting to disaggregate unemployment in the long run, it is supposed that wages are flexible and therefore endogenous. Thus a dynamic disequilibrium approach as opposed to a static disequilibrium approach is adopted. The problem of non-optimal behaviour is addressed within the dynamic estimation procedure adopted. Finally, non-tâtonnement economics has evolved out of a reappraisal of Keynes; the thrust of Keynesian economics is that quantities adjust faster than prices (as exemplified by the often-repeated assumption of fixed money wages in the short run).

The disequilibrium approach also overcomes an inconsistency of the Neo-Classical theory; that is, Neo-Classical interpretations propose that unemployment may
emanate from excessive (disequilibrium) real wages within a Walrasian framework. Therefore Neo-Classical theory (contrary to Classical) supposes a degree of disequilibrium. Consequently, both Keynesian and Neo-Classical doctrines can be captured by non-tâtonnement economics. This framework provides a simple dichotomy of unemployment into Keynesian and Neo-Classical. If prices react significantly faster than quantities, then the Neo-Classical analysis would be the predominant explanation of unemployment. If quantities react faster than prices, then a Keynesian scenario dominates. This exposition of the two theories is crucial when one wants to distinguish their effects within a dynamic framework.

It will also be demonstrated that there is almost no objective criterion clearly to distinguish between Keynesian and Neo-Classical theories of the labour market within a static (equilibrium) framework. The existence of a real wage overhang, for example, is not a sufficient criterion to distinguish between Keynesian and Neo-Classical unemployment. As a practical matter this point is highlighted by inspection of Table 1.5, which probably indicates that the steady rise in unemployment since 1973 is primarily the result of excessive real wages. "An index of unit labour cost - of how much must be spent on labour to produce a unit of output - [captures] ... real wage changes plus supplementary cost changes less productivity movements", (Hanratty and Vipond, 1982, p199). Rising real unit labour costs may not necessarily be the result of rising real wages. Hanratty and Vipond (1982, p199) state, however, that the main component of the rise in the real unit labour cost for the period 1973-75 was real wage movements. In the period 1966 to 1973 real unit labour costs remained constant, but rose by 0.7 per cent over the period 1973 to 1982 and by 0.4 per cent over the whole period 1966 to 1982. This undoubtedly indicates an excessive rise in labour costs; 9.7 per cent for the early period, 15.1 per cent during 1973-82 and an increase of 12.7 per cent over the whole period (1966-82). Labour productivity during 1973-82, however, increased at half the rate than for the period 1966-73, perhaps indicating that there was a dramatic decline in output for the period 1973-82. A decline in output, assuming downward rigidity of money wages, may result in excessive real wages due to a leftward shift of the marginal
revenue product of labour function: the result could be described as a real wage overhang. In a Neo-Classical scenario a real wage overhang may result from an exogenous wage push, whereas a Keynesian may explain a real wages overhang in terms of a leftward shift in the marginal revenue product of labour schedule; or if real wages are specified on the vertical axis of a labour market diagram, a decline in output may be captured as a movement up the labour demand function. Consequently, the observed phenomenon of a real wage overhang can be explained by both scenarios. Therefore, the existence of an overhang does not distinguish between the two doctrines. A measure of the relative speeds of adjustment of wages and employment toward equilibrium on the other hand, will hopefully provide a criterion for distinguishing between Keynesian and Neo-Classical theories. To capture a Keynesian scenario (an exogenous change in output) on a labour market diagram is difficult; presumably a change in output will manifest itself via a change in price. This difficulty is avoided by Patinkin (1956, 1965) whose arguments are developed in the following sections.

**TABLE 1.5**

**Nonfarm Productivity and Related Trends**

**September 1966-September 1982**

(annual rates of change)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Productivity</strong></td>
<td>3.6%</td>
<td>1.9%</td>
<td>2.7%</td>
</tr>
<tr>
<td><strong>Labour costs</strong></td>
<td>9.7</td>
<td>15.1</td>
<td>12.7</td>
</tr>
<tr>
<td><strong>Unit labour costs</strong></td>
<td>5.9</td>
<td>12.9</td>
<td>9.8</td>
</tr>
<tr>
<td><strong>Real labour costs</strong></td>
<td>3.6</td>
<td>2.8</td>
<td>3.1</td>
</tr>
<tr>
<td><strong>Real unit labour costs</strong></td>
<td>0.0</td>
<td>0.7</td>
<td>0.4</td>
</tr>
<tr>
<td><strong>Price inflation</strong></td>
<td>5.9</td>
<td>12.0</td>
<td>9.3</td>
</tr>
</tbody>
</table>

a Gross nonfarm output at 1979-80 prices per hour worked by nonfarm employees.
b Nonfarm labour compensation (wages, salaries, supplements, payroll taxes) per hour worked.
c Labour costs divided by productivity.
d Labour costs divided by implicit price deflator for gross nonfarm product.
e Unit labour costs divided by implicit price deflator for gross nonfarm product.
f Implicit price deflator for gross nonfarm product.

CHAPTER 2

THEORETICAL BACKGROUND

2.1 NEO-CLASSICAL ECONOMICS

At a broad level two variants of unemployment theory exist. One is the Lucas and Rapping (1969) model, which explains short-run variation in employment within an equilibrium framework. Consequently, all unemployment is voluntary. The other interpretation permits degrees of disequilibrium and therefore involuntary unemployment. It will be shown in this section that a disequilibrium approach to Neo-Classical unemployment is appropriate, thus allowing for a clear distinction to be drawn between Classical and Neo-Classical labour markets.

According to Shapiro (1974), the Classical theory evolved from the writings of Ricardo, Mill, Say and Marshall, long before the appearance of Keynes' 'General Theory', in 1936. "The Walrasian [Neo-Classical] system does not allow for market imperfections in the form of unions, minimum wage law, etc., and Say's Law does not allow for excess supply in markets" (Hughes and Perlman, 1984, p54). Say's Law is commonly stated as: the supply of goods and services creates its own demand. The implication is that there is no over-production. According to Harris (1981, p92), Say's Law asserts "that real national income is always at the full-employment level, since the corresponding supply of goods is always matched by demand". Say's Law, it is argued, is still valid when it is acknowledged that savings decreases consumption. In the Classical scheme, interest rates will decline which would stimulate investment to offset the decline in consumption. Aggregate demand cannot be deficient since savings and investment are synchronized by interest rates. Harris (1981), however, argues that there is a distinction between Say's Identity and Say's Law; the precise meaning or interpretation of Say is controversial. Say's Identity, where supply equals demand in the market when trade occurs, does not necessarily rule out the possibility of over-production. "As Sowell (1974) demonstrates, even Say himself admitted the possibility
of general gluts" (Harris, 1981, p97). The Neo-Classical theory, like the Classical theory, utilizes Say's and Walras' law. Neo-Classical theory however, relies more on the writings of Pigou: the Theory of Unemployment (1933) and Lapses from Full Employment (1944). Pigou in his writings acknowledges the imperfect nature of markets, in particular labour markets, and therefore unlike the Classical theory allows for bouts of involuntary unemployment. A number of institutional factors, such as unions, heterogeneous labour, segmented labour markets, and the immobility of labour between markets were, according to Solow (1980), addressed by Pigou in his writings:¹

"Pigou's remarks in the middle of the great depression, to the Macmillan Committee, when asked to explain why unemployment was so high, were... that the relative demand for labour in different occupations had altered, and the transfers of labour appropriate to those alterations have not taken place" (Lekachman, 1969, p50-51).

Solow (1980, p4) further argues that, in Pigou's 1933 paper, he made reference to minimum wages: "He [Pigou] wrote 'public opinion...builds up for itself a rough estimate of what constitutes a reasonable living wage. This is derived half-consciously from a knowledge of the actual standards enjoyed by more or less average workers'... Such feelings about equity and fairness are obviously relevant to setting statutory minimum wages, and Pigou uses them in that way". Interestingly, in 1907 in Australia, "Mr Justice Higgins was obliged to rule on what was a fair and reasonable wage rate sufficient to meet the needs of an average family man" (Veale et.al., 1983, p144). This resembles present day arguments that unemployment is Neo-Classical in the sense that economic and social institutions prevent the clearing of labour markets. Knowledge of "average workers' standards" implies wage comparisons and perhaps margins. Another factor mentioned by Pigou is the provision of unemployment insurance (Solow, 1980, p5). A strong inference is that wages need not adjust instantaneously to market forces in a Neo-Classical framework. Neo-Classical theory, as distinct from the Classical theory, permits a greater degree of disequilibrium.

¹ See Solow (1980) for a detailed discussion.
Both the Neo-Classical and Classical labour demand functions are based on two overlapping hypotheses. Firstly, firms are perfectly competitive in supplying their products and hiring labour, and they maximize profits. The second hypothesis, which is a corollary of the first, is that employed labour exhibits diminishing marginal returns. According to the first proposition, firms will be in equilibrium when the marginal product of labour is equal to the market real wage. The second hypothesis dictates that firms are induced to hire additional labour when real wages decline; this inverse relationship is depicted by $L_D$ in Diagram 2.1. Labour supply too is a function of the real wage, reflecting the choice between employment and leisure. The higher the real wage, the higher is the opportunity cost of leisure. When supply equals demand, equilibrium in the labour market is achieved. There is no involuntary unemployment; all those desiring employment are in fact working. This long run position, depicted by point E, is a characteristic of both the Classical and Neo-Classical theory, where in the long-run only frictional unemployment exists. In contrast to the Classical theory, the Neo-Classical doctrine explains short-run variation in (involuntary) unemployment (at $W_1$ in diagram 2.1). Indeed, according to Hughes and Perlman (1984, p55), "adjustment takes time - how long depending on how fast workers react to their predicament (i.e. disequilibrium) by adjusting their wages to put themselves back on their supply curve. There is nothing in Walrasian analysis to tell just how long this 'groping' toward equilibrium takes place, but it occurs rapidly enough so that there is no room in the analysis for a 'great depression'... [Adjustment is primarily via flexible wage (price) movements]... The theory would even admit to some small amount of long-run [involuntary] unemployment if workers refuse to lower their real wage because of institutional factors". This echoes the thoughts of Pigou.

The search theory of unemployment is distinguished from frictional unemployment in that real wages are assumed to be too high to clear the labour market. Briefly, it has been postulated that over the years, people have steadily been searching longer for employment due to changes in social and economic institutions.
Diagram 2.1

The Neo-Classical Labour Market

Real Wage (W)

W_1

W_e

\( L_D \)

\( L_S \)

\( L_e = L_D = L_S \)

Labour (L)

\( L_D \)

\( L_S \)

\( E \)

\( D \)

\( A \)

\( B \)

\( W_e = \) Equilibrium real wage

\( W = \) Actual real wage

\( L_S = \) Labour supply curve

\( L_D = \) Labour demand curve
Rising unemployment benefits have been singled out as a significant factor in explaining an increase in search unemployment. The advent of these benefits has lowered the opportunity cost of being unemployed; higher real wages are therefore necessary to attract labour into employment. Wachtel (1984, p267), states more formally that "the unemployed are said to have a reservation [wage] because their ability to acquire income through unemployment compensation deters them from taking certain jobs. A reservation wage is the wage rate that will induce an individual to forsake unemployment". Search theory assumes that efficient search activity occurs only when one is not working.

While this version of the Neo-Classical doctrine explains short-run variations in unemployment, the Classical theory does not. Both the Classical and Neo-Classical theories are general models and are embedded in Walras' Law. The salient features of Walras' Law are:

i) equilibrium is achieved instantaneously by price adjustment; and

ii) trade in the market place does not occur out of equilibrium.

The only steady-states are Walrasian equilibria, with market-clearing equilibrium prices.

"Walras' law implies that all prices cannot change in the same direction and that relative prices must change." (Varian, 1975, p218). The equality or intersection of supply and demand is first achieved and then trade or exchange occurs between buyers and sellers. With respect to the labour market, exchange will only occur at point E in diagram 2.1; by definition involuntary unemployment does not occur. Yet Neo-Classical theory as voiced by Pigou, acknowledges the imperfect nature of labour markets and therefore allows for bouts of involuntary [disequilibrium] unemployment. The Neo-Classical theory as distinct from the Classical model, may explain short-run involuntary unemployment; it is however, inconsistent with Say's Law and Walras' Law and therefore constitutes a theoretical break from Walras' general framework. The Lucas and Rapping (1969)

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2 It may be pointed out that when labour supply and labour demand functions intersect, the existence of frictional (voluntary) unemployment implies non-rééquilibrage; equilibrium prices may not clear the market. The fact that labour is searching suggests that the Walrasian auctioneer is not overseeing the market and providing complete information about wage rates and employment opportunities.
model overcomes this inconsistency by explaining short-run variation in unemployment within an equilibrium framework where all trade occurs at equilibrium positions.

As asserted by them, the Lucas and Rapping (1969) model (estimated for the period 1930-65) is Keynesian, but according to Rees (1970, p306) it appears to be "more Classical than Keynesian". The model describes a labour market that is in continuous short-run equilibrium (i.e. where labour supply equals labour demand). Those persons who want jobs have them; unemployment is therefore voluntary. The model is depicted graphically in diagram 2.2. Briefly, the economy is in long-run equilibrium at $E_0$ where long-run full employment ($L^e$) is given by the long-run supply of labour curve ($L^e$).

Suppose that the short-run full employment level is now $L^s$. The reduction in employment (measured as $L^s - L^e$) is purely voluntary. Rees (1970, p306) states: "the short-run supply is always equal to employment. Measured unemployment, though it is a component of the long-run labour supply [$L^L$], is not a part of the short-run supply [$L^L$]. This is equivalent to assuming that measured unemployment is voluntary....Since Lucas and Rapping do not regard measured unemployment as part of the short-run supply of labour, how do they regard it? In their own words, it is viewed 'not as an effective market supply, part of which cannot find employment, but rather as the supply of labour which would be forthcoming at perceived nominal wages and prices.' Measured unemployment (more exactly its non-frictional component) is then viewed as consisting of persons who regard the wage rates at which they could currently be employed as temporarily too low, and who therefore choose to wait or search for improved conditions rather than to invest in moving or occupational choice."

The authorities could attempt to artificially move the economy back to $E_0$. The result would be reduced unemployment at the expense of price inflation; this resembles the trade-off embodied in a stable short-run Phillips curve (where price is on the vertical axis), although the original Phillips curve used the rate of change of money wages instead of prices. Alternatively, the authorities could allow the economy to adjust to its long-run position (at $E_2$). The voluntarily unemployed revise their wage expectations downwards and accept a lower wage.
Diagram 2.2

A Classical Labour Market:
Lucas and Rapping (1969)

$SL_D$ = Short run labour demand curve
$SL_S$ = Short run labour supply curve
$L^L_e$ = Long run labour supply curve

Diagram showing the Classical Labour Market with the demand and supply curves indicating equilibrium with $W^3_e$, $W^2_e$, and $W^1_e$ as points of intersection.
Rees (1970, p308) criticizes Lucas' and Rapping's (1969) model on two fronts. He argues that "when all markets are depressed in varying degree, a few of the unemployed might still be able to find work by shifting their location or trade, but it is surely not true that all of them could do so at once". Rees (1970, p308) further points out that most Keynesians would argue that, even with flexible wages, aggregate demand would be reduced further if all workers reduce their wage. Patinkin's (1956, 1965) labour market model, developed later in this paper, shows that a general decline in real wages may not increase employment. The second misgiving concerns the model's inability to explain the long bouts of mass unemployment that occurred in the "ten years of depression in the U.S. and even longer in the U.K" (Hughes and Perlman, 1984, p55). In the Lucas and Rapping (1969) model the voluntarily unemployed hold out for jobs because the wage is 'temporarily' too low; however, as Rees (1970, p308) remarks, "it is hard to imagine the long-term unemployed holding out for jobs, comparable with their old jobs, at their old real compensation, over periods of up to ten years". Not all unemployment during the Great Depression was voluntary.

A final misgiving is that the Lucas and Rapping (1969) model, like Friedman's 'inflation-unemployment model', incorrectly predicts that the rate at which people quit jobs falls during a boom and rises during a recession. This is reflected by the proposition that the stable short-run traditional Phillips Curve is implied by the Lucas and Rapping (1969) model. Both theories also ignore the reality that most people do not voluntarily quit their jobs, in order to search for another job. Indeed, during a period of declining or slowly growing real wages, often the consequence of a recession (since wages and economic activity may be procyclical), workers will be less inclined to quit their current employment. Search activity tends to rise during a boom (when unemployment is low) and decline during a recession (i.e. high unemployment).

It has been demonstrated that the Lucas and Rapping (1969) model, while explaining short-run variation in unemployment within an equilibrium framework, has some theoretical problems. In particular it does not acknowledge involuntary unemployment, principally because involuntary unemployment can only be addressed in
a disequilibrium framework. The proposition that unemployment is a manifestation of non-tâtonnement can be drawn from Pigou's writings. However, the inconsistency of the Neo-Classical model still exists; i.e. disequilibrium trade within a Walrasian framework. A modification of Walras' Law, or a theory of disequilibrium where the market is not regulated by an auctioneer, is developed in the next section. Indeed, as Cherry (1981) points out, Keynesians argue that labour markets do not operate as auction markets. If trade does not occur at equilibrium prices, where does it occur?

2.2 NON-TÂTONNEMENT TRADE IN THE MARKET PLACE

The short-side (clearing or trade) rule will determine what transaction, or quantity of trade, takes place in the market when prices are not equilibrium ones.

Three axioms of trading out of equilibrium exist in the literature. They are:

i) rationed sellers and rationed buyers cannot exist in the same market. Households are sellers of labour time and buyers of goods in the product market. Firms on the other hand, are buyers of labour time and sellers of goods. When a market is characterized by excess supply (D<S) then sellers are rationed (quantity-constrained). When excess demand (D>S) occurs in the market buyers become rationed; excess supply and excess demand in the same market cannot occur simultaneously;

ii) efficiency: neither side would benefit from any extra trade; and

iii) exchange in the market place (trade) is voluntary.

These axioms ensure that the actual quantity transacted is the lesser of the amount demanded or supplied, depending on the state of the market. If the disequilibrium state of the market generated excess supply (i.e. actual price above equilibrium price) then the

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3 Voluntary trade posits a crucial proposition in welfare economics, that is, voluntary trade is mutually beneficial to both transacting agents (objective or utility functions are maximized). Trade that occurs in equilibrium positions leads to Pareto-optimal outcomes. However, when actual trade occurs at the lesser of supply and demand (i.e. actual price ≠ equilibrium price), this leads to non-Pareto-optimal outcomes, because of reduced volumes of exchange (trade) in the market. That is, actual trade is less than desired or equilibrium trade. Behaviour, however, is still optimal to the extent that individuals maximize their objective functions given all these constraints, including quantity constraints.
actual quantity sold would be equal to the amount demanded. Sellers will be quantity-constrained. "The quantity traded in the market is determined by the quantity people wish to buy at this high price rather than the larger quantity producers wish to sell" (Bowden, 1978a, p10). If the disequilibrium market generated excess demand (a price below the equilibrium price), then the amount actually sold would be equal to the amount which sellers wish to supply. Buyers are therefore quantity-constrained. "The basic idea behind [the short-side rule] is that consumers cannot be sold more than what they want, and that not more can be sold than is produced." (Bowden, 1978a, p10).

Sinclair (1987, p66) elaborates: "When a market fails to clear, either buyers or sellers will be unable to trade in the quantities they would like to at the going [disequilibrium] prices. When the quantity demanded falls short of the quantity offered for sale, there is excess supply. This characterizes a buyer's market: buyers have no trouble in purchasing what they want to buy. Sellers will be eager to seek them out. The opposite occurs when demand outstrips supply. Here we encounter a seller's market; buyers cannot buy all they wish, while sellers can afford to be choosey. The essential idea governing the actual volume of trade in such circumstances is the short-side principle. This stipulates that the effective quantity transacted will be whichever is lower of demand and supply. It in turn suggests that one side of the market will be [non-priced] rationed in the quantity of trade they can undertake".

Casson (1981, p41-2) succinctly explains: "because transactions are voluntary, the quantity traded cannot exceed either the amount demand [D] or supplied [S]. And because traders will not forgo opportunities for mutually beneficial transactions, the quantity traded [Q] will never be less than the minimum of the demand and supply. The actual quantity traded [Q] must therefore be equal to the minimum of demand and supply." Consequently, trade occurs on what is called the short-side of the market (i.e. either demand is short and D<S, or supply is short and D>S). The rule is stated below:

\[ Q = \text{Min}(D,S) \]

An example of trading on the short-side in reference to the labour market is provided by point A in diagram 2.1. Here the labour market is characterized by excess
labour supply; labour is rationed (quantity-constrained) in selling some of its labour time. The actual amount of labour traded, in this example, is the amount of labour demanded by firms. Point D indicates that the quantity (of labour) that is traded in the market place is the quantity (of labour) supplied. Assuming that the gap AB describes involuntary unemployment, the relevance of disequilibrium theory becomes apparent. Point B is an example of the long-side of the market.

In contrast, within the Walrasian general equilibrium theory, individuals are able to buy and sell as much of a commodity (be it labour or consumption goods) as they want; they are not quantity-constrained. Hence, optimum trade in consumption or employment is decided upon by economic agents given other constraints; mainly, given prices and endowment of income (i.e. budget constraints). Thus, a modification of the Walrasian system is that firms and consumers are constrained not only by endowments and given prices, but also by quantities. Consequently, trade other than at equilibrium can occur on the short-side of the market along the locus LD, E, LS in diagram 2.1. Point E depicts market-clearing equilibrium prices. The remaining points along LD and LS depict non-clearing disequilibrium prices; disequilibrium trade occurs on the short-side of the market. Equipped with this basic theory of disequilibrium trade, the Neo-Classical theory is able to explain short-run bouts of involuntary unemployment: real wages may not adjust instantaneously, due to institutional rigidities and poor information flows, while prices still react significantly faster than quantity.

A number of choice-theoretic disequilibrium models, which are not without theoretical problems, have evolved in the literature or disequilibrium, such as Muellbauer and Portes (1978) and its descendant work by Honkapohja and Ito (1985). A choice-theoretic framework preserves the traditional assumptions of economic agents as rational optimizing individuals. These models are based on maximizing objective functions (i.e. profit and utility functions); that is, objective functions are maximized given the usual Walrasian constraints plus a quantity constraint which is a manifestation of the short-side rule which they employ. The models assume fixed prices (wages). This may be inappropriate since, as Bowden (1978a) points out, the information requirements of the
short-side rule implies paradoxically that markets may not persist in a state of disequilibrium. Strictly, the short-side rule implies that in equilibrium all that is offered is sold. "This implies that all buyers must have the facility of making successful contact with sellers in the period considered. Similar remarks hold for other [disequilibrium] prices" (Bowden, 1978a, p11). If the market is characterized by excess demand \( W < W^e \) and trade occurs on the short-side of the market, then "all sellers are successfully sought out by buyers" (Bowden, 1978a, p11). When excess supply exists \( W > W^e \), "all buyers are successfully located by sellers" (Bowden, 1978a, p11). Informational flows are not impeded; disequilibrium therefore may not persist. Consequently, the short-side rule has normally been applied to administered or fixed-price disequilibrium models. The frequent practice of appending a price-adjustment equation to a market model for econometric purposes in conjunction with the short-side rule of the form,

\[
P_t - P_{t-1} = f(D-S)
\]

is therefore inconsistent. Hey (1981, p20) further remarks that "at an aggregate level, optimizing and equilibrium necessarily go hand-in-hand or... optimizing and [dynamic] disequilibrium are incompatible. [Dynamic] disequilibrium implies that some decision-maker has been frustrated in his plans, but if someone is frustrated, then optimizing has not been achieved." Furthermore, Rosen and Quandt (1978, p374) point out that the price-adjustment equation also "lacks a choice-theoretic foundation". Moreover, according to Honkapohja and Ito (1985), there appears to be no satisfactory theory explaining why price (wages) should be rigidly fixed in the short-run. Benessy's (1976), Hahn's (1978) and Nigishi's (1979) conjectural equilibria analysis (cited in Honkapohja and Ito (1985)), however, attempts to provide a model to explain short-run price and wage rigidity. Briefly, the theory is analogous to oligopoly price theory, where if a labourer conjectures that other workers will follow his lower wage offer, then that person's employability is unchanged. Fixed-price disequilibrium models are equilibrium models, (i.e. SSE), even though disequilibrium unemployment is being studied. Since prices in these models are not flexible they do not perform their function of rationing among different consumers over time.
As a result, these models make explicit non-price rationing schemes. Briefly, economic agents who face not only the usual Walrasian constraints but also quantity constraints (in that they may not be able to buy or sell as much of a good as they desire) will be rationed. Stochastic rationing occurs where rationed agents may be either totally satisfied or totally dissatisfied. Alternatively, a deterministic rationing device means that all rationed agents are partly satisfied. Agents may be allocated output in proportion to their stated demand or allocated equal amounts (a uniform scheme). A proportional scheme is manipulable in that actual trade is a function of stated trades. As Drazen (1980) points out, a rationed agent may overbid in order to increase actual trade and realize his/her desired trade. An example of overbidding, given by Muellbauer and Portes (1978), is the placing of multiple or extra orders by constrained agents. Drazen (1980) further points out that, if all agents behave in a similar fashion, no SSE will exist. A uniform scheme may force persons to over-supply or over-consume, thus violating the voluntary aspect of the trading rule; as an example, labour may be forced to work overtime. Furthermore, a uniform scheme suggests a rationing centre and as Grandmont (1977) points out this is synonymous to assuming a tâtonnement in quantities. If quantities can be centrally co-ordinated, so too can prices. Consequently, quantity constraints need never arise. The stochastic scheme conforms to reality and is more plausible in a situation where a constrained agent either gets his demand or supply completely satisfied, or gets nothing at all.\footnote{See Svensson (1980), Benassy (1982), Green (1980), Honkapohja and Ito (1985) and Hey (1981) for worked numerical examples of the various schemes.}

Honkapohja and Ito (1985) extended Muellbauer's and Portes' model (1978) by using a stochastic rationing scheme as opposed to a deterministic rationing scheme. The contribution of Muellbauer and Portes (1978) was to include inventories in their static disequilibrium model. A forerunner to these models was the Barro and Grossman (1971) general (static) disequilibrium model.\footnote{The Barro and Grossman (1971) model is a synthesis of the analyses of Patinkin (1956) and Clower (1965). These evolved out of a reinterpretation of Keynes, theory in which they argue that Keynesian theory is best interpreted as a disequilibrium theory. Contributions to this line of thought have also been made by Malinvaud (1977).} These are two-market models, taking into
account the spillover effect of dissatisfied demand or supply in one market into other markets. The short-side rule is made explicit in these models, except in the Barro and Grossman model, where it is implied. This rule, however, has some further problems. Benassy (1982, p12) makes the point that the short-side rule, when applied to a multi-market economy, will lead to inconsistent transactions, violating either feasibility or the budget constraints of the agents. Consider a "firm in a situation of excess demand for its inputs and outputs. Since there is excess demand in the input markets, the firm purchases fewer inputs than its Walrasian demand. However, since there is excess demand in the output markets and the firm is a seller, sales or output should equal the Walrasian supplies. The application of the short-side rule would thus call for producing the Walrasian inputs - a technologically unfeasible situation. Analogously, imagine a household facing excess supply for the goods it purchases and the goods it sells. Under the short-side rule, its sales would be lower than its Walrasian supplies but its purchases would be equal to its Walrasian demands. As a result this household's transactions would violate the budget constraint". Consequently, the theory of exchange and demand needs to be reformulated.

"If agents are rationed in one market, their actions in other markets, where they still have freedom to transact as they wish, are likely to change as a result. This gives rise to an important distinction between notional [Walrasian] and effective demands or supplies. The notional demand for goods by households, for example, is the quantity they would like to buy, at the going set of [equilibrium] prices and wages, if they are able to achieve their desired trades in all markets. If they are not [able to achieve their desired trades] as a result, let us say, of excess supply prevailing in the labour market, their effective demand for goods will be the amount they wish to buy, once they know that they will be unable to sell all the labour time they want" (Sinclair, 1987, p66). Labour is quantity-constrained in the labour market, which will spill over and impact on the goods or product market. Likewise, a firm's effective demand for labour is influenced by sales constraints that a firm faces in the product market.
Subsequently, a body of literature has evolved which draws a distinction between notional (Walrasian) and effective demand. Generally, effective demand is defined as demand expressed in the market, taking into account quantity constraints. Varian (1975, p218) succinctly explains that the "demands actually presented in the market i.e., the demands that affect price movements, are not Walrasian demands. Rather they are effective demands; these demands are a function of both price and quantity signals." On the other hand, the notional demand for consumer goods (Q) assumes that labour, in attempting to maximize utility \([U = f(Q,L_S)]\), can sell as much labour (L_S) as they desire,(Hanratty and Vipond, 1982, p170). The utility function is based on the notion that households, in a Walrasian model, make simultaneous decisions about how much labour time to supply and how much output to demand or consume; this is termed the dual decision hypothesis by Clower (1965). The effective demand for final goods assumes that labour is quantity-constrained; labour can sell only as much labour time as the product market demands. Effective demand for goods by households is derived by re-specifying the utility function with quantity constraints; there are a number of variants of this within the literature of disequilibrium. All the above authors employ this distinction in their models.\footnote{The theory of effective demand is quite extensive. Briefly, however, there are two types of effective demands: (i) the Drèze (1975) and (ii) Clower (1965) demands. The Drèze (1975) demand is where an agent maximizes utility by incorporating all quantity constraints, i.e. quantity constraints in the market the agent is trading in and all other markets. This effective demand, however, does not yield a measure of disequilibrium in that effective demand will equal effective supply. The Clower (1965) effective demand is the demand expressed in one market but taking into account quantity constraints in all other markets. While Clower (1965) gives a measure of disequilibrium, it does not emerge from optimizing behaviour. For a detailed analysis see Green (1980) and Honkapohja and Ito (1985). The latter, therefore, employ a stochastic rationing scheme because, as they remark, it provides a "natural measure of market imbalances and consistent micro-foundations of effective demands" (Honkapohja and Ito, 1985, p67). Barro and Grossman (1971), Malinvaud (1977) and Portes and Muellbauer (1978) employ Clower’s (1965) concept of effective demand.}

Fixed-price disequilibrium (i.e. SSE) theory is not without difficulties. Given a two-market model and a vector of disequilibrium prices and wages, four regimes that have evolved from disequilibrium literature can be identified. The two of particular relevance are:

i) (New)Keynesian unemployment, and

ii) Neo-Classical unemployment.
Neo-Classical economics, with respect to the labour market, breaks from the Walrasian (equilibrium) framework and permits, as implied by Pigou, degrees of disequilibrium due to institutional factors; excess labour (involuntary unemployment) arises from excess real wages due to unions and/or central wage determining processes. (New)Keynesian theory embraces a dynamic disequilibrium (non-tâtonnement) framework, in which real wages are flexible, yet involuntary (Keynesian) unemployment can still be extracted. Institutional factors are not the underlying explanation of involuntary unemployment. This line of theorizing is pursued in section 2.3. In contrast the Neo-Keynesian theory, as exemplified by Hick's IS-LM model, is essentially an equilibrium framework, sometimes called the Neo-Classical synthesis. The only way to extract Keynesian unemployment is to impose, for example, the assumption of money wage rigidity; however, the difference between Neo-Classical and Neo-Keynesian unemployment becomes unclear. The Neo-Classical and (New)Keynesian theories are both embedded in a disequilibrium framework.

Post-Keynesian economics, led by Joan Robinson and Piero Sraffa, revolves around the Cambridge controversies on capital (Clarke, 1989/90, p161), and focuses on income distributions, (Canterbery, 1987, p274). Sraffa modernized some thoughts of the Classical economists by revamping Ricardo's labour theory of value and emphasizing the circularity of the production process; Sraffa's contribution to Post-Keynesian thought is sometimes called Neo-Ricardian. Post-Keynesian theorizing also embraces disequilibrium; (New)Keynesian and Post-Keynesian theories to this extent overlap. Presented in table 2.1 is (New)Keynesian and Neo-Classical unemployment where the nature of the product market is made explicit.

The bar denotes effective supply ($S\bar{}$) or demand ($D\bar{}$). The absence of a bar subscript denotes Walrasian (notional) supply and demand in the respective markets. The symbols in the brackets provide an alternative specification of disequilibrium: equilibrium would be denoted by for example, $L_D = L_S$ and therefore $L_D = (L_D)$


**TABLE 2.1 Disequilibrium Regimes**

<table>
<thead>
<tr>
<th></th>
<th>Labour market (L)</th>
<th>Product market (Q)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) (New)Keynesian</td>
<td>$L_D &lt; L_S$</td>
<td>$Q_D &lt; Q_S$</td>
</tr>
<tr>
<td>unemployment</td>
<td>($L_D &lt; L_D$)</td>
<td>($Q_D &lt; Q_D$)</td>
</tr>
<tr>
<td>(2) Neo-Classical</td>
<td>$L_D &lt; L_S$</td>
<td>$Q_D &gt; Q_S$</td>
</tr>
<tr>
<td>unemployment</td>
<td>($L_D &lt; L_D$)</td>
<td>($Q_S &lt; Q_S$)</td>
</tr>
</tbody>
</table>

(effective demand equals notional demand). The distinction between (New)Keynesian and Neo-Classical scenarios is quite clear. While in both the Neo-Classical and (New)Keynesian scenarios, output is insufficient to clear the labour market, the underlying cause is quite different. This is apparent in the diagrammatical representation of the respective product markets. For (New)Keynesians, product prices are too high to clear the product and hence labour markets (Layard and Nickell, 1985). In a Walrasian framework trade will only occur in equilibrium ($Q_D = Q_S$), and generate $Q_D$, but assuming disequilibrium, effective demand for output ($\bar{Q}_D$) can be less than $Q_D$ (Part A). Sinclair (1987, p67) elaborates: (New)Keynesian unemployment is characterized by excess supply in both the labour and product markets. This position is reached by starting from a Walrasian equilibrium and raising the price level. "Firms will react to the cut in the real wage that a higher price level implies, when the money wage is given, by wanting to employ more people and sell more output. This will be the change in its notional demand and supply. But it will be frustrated... A higher price level...[ceteris paribus]... means a fall in the households' real financial wealth. [Households] will seek to cut back their spending. We have assumed that consumption
Diagram 2.3

The (New) Keynesian Product Market ($Q_D < Q_D$)

**PART A**

**The Neo-Classical Product Market** ($Q_s < Q_s$)

$Q_D, Q_s =$ Walrasian (notional) product demand and supply respectively

$\bar{Q}_D, \bar{Q}_s =$ Effective product demand and supply
bears a constant proportionate relation to their real money holdings... Firms will perceive that they are forced to accept a reduced volume of sales, despite the incentive to increase production that the higher price level brought... They simply cannot sell everything which it is profitable to produce at the new price level". A corollary to this scenario, which will be developed in section 2.3, is that a reduction in the real wage is not sufficient to reduce unemployment; "in the Great Depression, prices and wages did fall" (Frank, 1986, p8).

In the Neo-Classical regime the real wage is artificially forced up or kept high, resulting in excess demand on the product market; the supply curve has shifted to the left and settled at $Qs$ in Part B of diagram 2.3. An increase in price will restore equilibrium in a Neo-Classical framework in both the labour and product market; real wages will decline and output would expand along $Qs$ in part B of diagram 2.3. In contrast, an increase in price will exacerbate (New)Keynesian unemployment.

It is apparent from Levacic and Rebmann (1988) that underlying the (New)Keynesian regime is the analysis of Patinkin (1956, 1965), where real wages move pro-cyclically. The particular importance of Patinkin's analysis, along with Clower's (1965) dual decision hypothesis, is that it provides consistency between micro-economics and macro-economics. Grandmont et.al. (1978, p84) state that "disequilibrium paves the way for a reconciliation between micro and macro theory". For example, deriving a household's demand for goods from a utility function, which includes quantity constraints, yields micro (household) demand functions similar to the form of an aggregate consumption function. Patinkin's disequilibrium interpretation of Keynes also clarifies the elusive concept of involuntary unemployment. Briefly, involuntary unemployment may exist at equilibrium wages; that is, $L_D < L_D$ while $L_D = L_S$. For this to occur firms (and labour) must be off their respective curves, and the labour market may be characterized by a non-clearing equilibrium price of labour. These issues are addressed in the next section, where it is also shown that the Keynesian analysis is best embraced by a dynamic disequilibrium framework.
2.3 (NEW)KEYNESIAN ECONOMICS:

2.3.1 Keynes and Non-Tatonnement

A conclusion reached by the Neo-Classical economists was that cyclical economic upturns are inversely related to the real wage rate. Patinkin (1956, 1965) using a disequilibrium framework, alters this conclusion. Moreover, unemployment is generated through insufficient output without placing restrictions on the movement of the real wage, thus providing an unambiguous definition of involuntary unemployment; the non-clearing equilibrium real wage means labour is off its labour supply function. A disequilibrium approach to Keynes is, according to Benassy (1982, p2), the relevant framework. He states: "macroeconomic models in the Keynesian tradition...violate the main characteristics of equilibrium economics: (i) since the labour market [exhibits] unemployment, at least one market is not in equilibrium, (ii) some adjustments are not brought about by price movements alone, e.g. the goods market is equilibriated through movements in the level of national income [quantity] and finally, (iii) agents do not react only to price signals e.g., the Keynesian consumption function depends on the level of income".

The IS-LM framework and its notions of equilibrium is not Keynes. Hey (1981, p204) remarks: "the demand for labour function in the standard IS-LM model is the usual marginal product of labour curve; this embodies the implicit assumption of unconstrained behaviour". Patinkin (1956, 1965) criticizes this underlying assumption of the Classical/Keynesian labour demand curve, and evolves a theory of the labour market where unemployment is seen to be a consequence of disequilibrium. Position B in Diagram 2.4 implies that the firm is not quantity-constrained in the output market and can sell all that it can produce (Kennedy, 1985). In microeconomics, labour demand functions show the quantity of labour
Diagram 2.4

The Patinkin Labour Market

\[ W^e = \text{Equilibrium real wage} \]
\[ W_i = \text{Actual (disequilibrium) real wage} \]
\[ L_D, L_S = \text{Walrasian (notional) labour demand and labour supply function respectively} \]
\[ \bar{L}_D = \text{Effective demand for labour} \]
\[ Q, \bar{Q} = \text{Walrasian (notional) and effective level of output respectively} \]

\[ \text{Real Wages} \]
\[ \text{(W)} \]

\[ \text{Labour (L, \bar{L})} \]

NB: Controversy exists over Keynes' labour market. That is, is the labour supply function solely a function of money wages? "Leontief (1937) maintained that Keynes had assumed that workers were subject to money illusions" (Addison and Burton, 1982, p3). However, "the nearest ....Keynes comes to a precise formulation of the crucial issue is his assertion that the supply of labour depends not upon real but (also) upon money wages" (Ibid, p4). This paper assumes that labour may not suffer from money illusion and therefore accepts Patinkin's supply of labour function as a function of real wages.
demanded by firms, at given real wage levels, assuming that firms can sell all the output they desire at the prevailing product price. Points on a labour demand function assume that firms are not quantity-constrained. For example, a given level of employment implies a given level of output; a higher level of employment, captured as a movement down a labour demand function, implies a higher level of output. Increased employment levels will only occur if the extra output is sold. Points on the labour demand function, therefore, imply unconstrained behaviour in terms of firms choosing employment and output levels without hindrance; i.e. no sales constraint. Patinkin (1956, 1965), derives an effective demand for labour (LD) function for a given level of demand for output. Notional demand for labour is denoted (LD). This is the amount of labour demanded, assuming that the product market is in equilibrium. Note that Patinkin does not employ these terms.

Following Barro and Grossman (1971), a representative firm perceives that it is neither output- (i.e. sales-) nor labour-constrained, and maximizes profit (\(\pi\)) given by

\[
\pi = Q_S - WLD,
\]

where \(Q\) and \(W\) denote the quantity of output and the real wage respectively, and the subscripts denote supply (S) and demand (D).

Assuming a production function of the simple form,

\[
Q = F(L),
\]

profit maximization is given by,

\[
LD = L(W), \text{ such that } \frac{dF}{dL} = W,
\]

which implies diminishing marginal productivity. Thus, the notional supply of output is a function of the notional demand for labour: \(Q_s = F(L_D)\). This analysis is captured at point E in Diagram 2.4 which was also discussed in Section 2.1. There are no quantity constraints, hence labour and firms trade on their supply and demand curves, where perceived constraints are zero and are equal to actual constraints. In other words, in
deriving a firm's demand for labour mathematically it is assumed that the firm can sell as much output it produces.

In contrast, suppose that the firm is now output-constrained and cannot sell all of its notional supply (Qs). Then commodities in the product market are in excess supply, so that the actual sale of output (QD) (effective consumption demand) is less than notional demand (QD < QD, refer to diagram 2.3, part A). Hence, given (QD) the firm maximizes π (given by ABW1 in diagram 2.4), by

\[ \pi = Q_D - WL_D \]

subject to equation (4). The effective demand for labour becomes,

\[ L_D = F^{-1}(Q_D) \text{ for } dF/dL \geq W. \]

Since the product market is not in equilibrium the effective demand for labour (LD) will be less than the notional demand for labour (L_D).

The essence of Patinkin's (1956, 1965) analysis is that excess supply of output (QD < QD) causes excess supply of labour (L_D < L_D), and wages may now move procyclically with the trade cycle. Barro and Grossman (1971) start their scenario by supposing that product demand is too low (QD < QD). The consequence is excess supply of labour at point Z. The effective labour demand becomes ABLD (Q). To the extent that real wages respond to (L_D < L_D), real wages will fall towards W3, or point F. Suppose now that some policy action is taken to restore effective product demand, then a rising real wage will accompany a rise in employment and output, thus closing the gap from ZE to GE.

Within this analysis the concept of involuntary unemployment is no longer vague. In a Walrasian framework (where notional supply and demand is used) involuntary unemployment may only exist above W_e, such as at W1. Keynesian involuntary unemployment can be captured by the gap BC. Yet, in another sense it is difficult to avoid the proposition that the gap BC constitutes voluntary unemployment, to the extent that the excessive real wage is the cause of unemployment and workers resist a decline in real wages. Even with Keynes' proposition, where workers' resistance to a lower
money wage keeps the real wage high, the gap BC could be considered as voluntary unemployment. This vagueness is overcome since at point Z unemployment is uniquely due to variations in output: the real wage is unchanged. The real cause of unemployment is insufficient product demand. Stimulating output would reduce involuntary unemployment as illustrated by a shift from point Z to point G.

The labour demand function, therefore, should have output explicitly as a right-hand side variable. Involuntary unemployment is given by the gap ZE. If wages decline to W₃ (point F) then involuntary unemployment is replaced by voluntary unemployment. Hughes and Perlman (1984, p68), make an important point that although Barro and Grossman (1971) "see the possibility of point F being attained, they do not argue that it will be an unstable real wage". A reduction in real wages does not decrease unemployment, but only changes its nature. A real wage in excess of Wₑ is (in Barro and Grossman's words) a type of Neo-Classical involuntary unemployment. They state: "no stimulation of [product] demand could bring about full employment equilibrium, unless real wages were reduced" (Barro and Grossman, 1971, p87). In other words a reduction in real wages is not sufficient to generate full employment, as the economy may move from point B to point Z. This is Keynesian in the sense that product demand is insufficient; however, it is Neo-Classical to the extent that a necessary pre-requisite for effective stimulation of product demand is the reduction of the real wage overhang. Indecs (1986, p80) provides some indication that Australia may be experiencing Neo-Classical involuntary unemployment. The authors state: "the near abolition of the overhang in 1980 brought only a minor fall in unemployment, and its complete abolition in 1984 still left unemployment at around 8 per cent of 1985, a long way above the pre-overhang, full employment levels". Furthermore, Hanratty and Vipond (1982, p203), illustrate "how [New]Keynesian and [Neo]-Classical unemployment can emerge at the same time... Demand expansion alone...could not produce full employment; real-wage cuts would also be required".

Clower (1965) demonstrates that the Keynesian consumption function too is a consequence of trading in disequilibrium. Hey (1981, p203) makes the point that the
"consumption function remains an essentially ad hoc construct"; and often the micro-
foundations are not specified. Analogously to Patinkin (1956, 1965), Clower (1965),
presents the consumption function as a manifestation of disequilibrium in the labour
market based on micro-foundations. Barro and Grossman (1971) demonstrate how a
representative household maximizes utility given, that consumers are constrained in
purchasing output and selling its labour. Income becomes exogenously determined.
Casson (1981, p34) remarks that, once it is recognized that trade occurs out of
equilibrium, the exogeneity of income in the consumption function is the correct
specification. "When money wages are too high households face a constraint on their
supply of labour. As a result of this, income becomes exogenous to the household". In
explaining Clower's (1965) position, Barro and Grossman (1971) make quantity-
constraints explicit, so that workers cannot sell as much labour time as they would like.

The IS-LM and income-expenditure models recognize that excess labour has
repercussions in the product market by entering realized (effective) income in the
consumption function as a separate argument, but ignore the repercussions of excess
output on the labour market by specifying labour demand as a function of real wages
only. This not only explains the unrealistic countercyclical prediction of real wages, but
as Hey (1981) points out, makes the IS-LM framework internally inconsistent; labour is
constrained but firms are not constrained when effective income is less than notional
income. Finally, within the IS-LM framework, if a rigid wage causes unemployment
then a reduction in the real wage would cure unemployment. Keynes (1936) denied this
conclusion yet, if real wages are flexible, involuntary unemployment should not arise.
This inconsistency can be overcome if Keynes' (1936) theory is interpreted as a dynamic
disequilibrium analysis where real wages may vary but rarely reach equilibrium.
Kennedy (1979) and Wells (1977) voice a similar opinion. Kennedy (1979, p213) states
that "Keynes treated a [position of less than full employment] as an equilibrium because it
is a state of rest for the economy. Defining equilibrium not as a position of rest, but as a
position in which all markets are cleared gives the alternative disequilibrium
nomenclature". Moreover, Ackley (1961) supposes that "Keynes admitted some
departure from the assumption of a completely rigid money wage" (Addison and Burton, 1982, p5). Rees (1970, p308) also embraced the Keynesian notion that even with flexible wages aggregate demand would be further reduced if there was a general reduction in the worker's wage. Consequently, the decline in money wages which occurred during the great depression may not have cleared the labour market. This line of thought is developed in the following section.

2.3.2 Dynamic Disequilibrium Theory and Keynes

This section will demonstrate that, within a dynamic disequilibrium framework and despite the removal of the assumption of rigid downward money wages, it is still possible to extract Keynesian propositions. In particular, unemployment is a function of output and a general reduction of money wages will not cure unemployment. At the same time it will be demonstrated that full employment equilibrium theories, Classical and Neo-Keynesian (exemplified by the income-expenditure and IS-LM models), are not dissimilar. Only within a non-tâtonnement framework does a clear distinction emerge. An interpretation present in the literature on disequilibrium economics is that disequilibrium theory may be seen as filling in the theoretical gaps of Neo-Keynesian models. Briefly, these models have accepted that labour is a derived demand and consumption (demand for output) is a function of effective (actual) income; they merely failed to elaborate on the underlying quantity-constrained maximization behaviour of economic agents. These micro-foundations have been addressed by Barro and Grossman (1971), Muellbauer and Portes (1978) and Hankapohja and Ito (1985). It is equally true, however, that non-tâtonnement theory may render Neo-Keynesian (equilibrium) models, as voiced in Section 2.3.1, internally inconsistent, and that Walrasian theory is a unique case of non-tâtonnement theory.

The proposition that only within a non-tâtonnement framework does a clear distinction manifest between Classical theory and Keynes is developed by reference to Table 2.2, where Q, C, I and r denote respectively notional quantity, consumption, investment and the interest rate. The Neo-Keynesian and Classical theories are very
### TABLE 2.2

Comparison of Equilibrium and Non-Tâtonnement Theories

<table>
<thead>
<tr>
<th>Walrasian (equilibrium) framework</th>
<th>Neo-Keynesian (full employment) model</th>
<th>Non-Tâtonnement Models</th>
</tr>
</thead>
<tbody>
<tr>
<td>Classical (full) employment theory</td>
<td>Neo-Keynesian (full employment) model</td>
<td>New Keynesian (Unemployment) model</td>
</tr>
<tr>
<td>Labour market</td>
<td>( L_S = g(W) ) (1)</td>
<td>( L_S = g(W) ) (7)</td>
</tr>
<tr>
<td>Product market</td>
<td>( L_D = g(W) ) (2)</td>
<td>( L_D = g(W) ) (8)</td>
</tr>
<tr>
<td>( L = L_S = L_D ) (3)</td>
<td>( L = L_S = L_D ) (9)</td>
<td>( \bar{L}_D = \bar{L}_D ) (15)</td>
</tr>
<tr>
<td>Product market</td>
<td>( Q_S = q(L) ) (4)</td>
<td>( Q_S = q(L) ) (10)</td>
</tr>
<tr>
<td>Product market</td>
<td>( Q_D = C(r) + I(r) ) (5)</td>
<td>( Q_D = C(\bar{Q}) + I(r) ) (11)</td>
</tr>
<tr>
<td>Product market</td>
<td>( Q_S = Q_D = \bar{Q} ) (6)</td>
<td>( Q_S = Q_D = \bar{Q} ) (12)</td>
</tr>
</tbody>
</table>

#### Diagram 2.5

*Constructed from above Table 2.2*

similar (except for the consumption function) where equilibrium occurs when \( \overline{Q} = Q \) and thus \( \overline{L} = L \). In other words, the notional supply of output (labour) equals the notional demand for output (labour). There are no quantity constraints; hence effective output \( \overline{(Q)} \) equals notional output \( (Q) \), and all planned trades are realized. There are thus no involuntary inventories or unemployment; firms trade on their labour demand curves and workers trade on their supply curves simultaneously in equilibrium. Significantly, within the (Walrasian) equilibrium framework there is no clear distinction between Classical and Neo-Keynesian labour markets. If one considers positions of involuntary (disequilibrium) unemployment, the system of equations needs to be altered. This alteration highlights the point that Walrasian theory is a unique case within the economics of disequilibrium.

The production function, (4) and (10), is a special case of (16); the production function is a locus of effective output \( \overline{Q} \) and labour \( \overline{L} \), of which there is one unique point which constitutes full employment (i.e. \( \overline{L} = L \)). Consequently, the relevant demand for labour will be determined by the effective level of output (14). In a disequilibrium framework, (New)Keynesian steady-state equilibrium (SSE) occurs when effective output \( \overline{(Q)} \) is less than notional (full employment) output \( (Q) \). SSE is defined (in (18)) as equality between effective supply of output \( (Q_S) \) and effective demand for output \( (Q_D) \).

Note that SSE in the labour market is determined by (New)Keynesian SSE in the product market. Walrasian equilibrium in the labour market is non-existent and according to Patinkin (1956, 1965) effective demand for labour \( (\overline{L}) \) becomes a function of effective output \( (Q) \). Significantly, only within a non-tâtonnement framework does one obtain a clear distinction between Keynesian and Neo-Classical propositions.

This is more clear in the graphical analysis (Diagram 2.5), where point Z denotes a (New)Keynesian situation and point B describes a Neo-Classical situation; BZ captures Neo-Classical involuntary unemployment. In quadrant I (Walrasian) full employment is given by \( Q = \overline{Q} \), where notional output \( (Q) \) equals effective output \( (\overline{Q}) \). The broken line captures the Classical and Neo-Classical demand for output. It is vertical because \( Q_D (C + I) \) is determined by \( r \) only (and \( r \) in turn is a function neither of \( (C + I) \) nor \( (Q_S) \)).
When the aggregate demand curve intersects the 45° line at $E_1$, there exists excess notional supply equal to $(E_1 - F_3)$. This is an unstable position and Say's Law (i.e. where saving and investment is equilibrated by $r$) ensures (Walrasian) full employment at $F_1$, $(Q_D = Q_S = Q)$.

In the (New) Keynesian scenario effective consumption is a function of effective income. They are considered to be effective aggregates, because they are a manifestation of quantity constraints. The consumption function is positive, reflecting a direct relationship between consumption and income. Position $E_1$ reflects excess notional supply; however, since trade occurs out of equilibrium, effective demand $\overline{Q}_D (C + I)$ is less than notional demand, $Q_D (C + I)$. Following Patinkin (1956, 1965) both firms and workers move off their respective curves in the labour market: point $Z$. Position $F_1$ is a unique position along a loci of disequilibrium points on the 45° line where $\overline{Q}_D = Q_D$. Point $E_1$ is where effective demand, $\overline{Q}_D (C + I)$, is equal to effective supply $(Q_S)$.

The graphical analysis, however, also highlights the tendency toward full employment. In order to extract Keynesian conclusions, that is, persistent disequilibrium unemployment, three special assumptions are required: (i) the liquidity trap; (ii) interest-inelastic demand functions; and (iii) rigid money wages. Imposing these assumptions, however, in an attempt to contrast the Classical model and Keynes is unfortunate, as it renders (New) Keynesian theory similar to the Walrasian doctrine, in particular the full employment Neo-Keynesian model. If the analysis was not static, then within an equilibrium framework the labour market would adjust to point $E_2$ and remove involuntary unemployment. These three assumptions, and in particular money wage rigidity, necessitate the Walrasian policy prescription for solving unemployment: a decrease in money wages. This Keynes denied. Moreover, Weintraub (1975, p540) makes the point that Keynes' investment demand function is interest-sensitive, "since the demand price of a capital good is, by the MEC schedule, inversely proportional to the interest rate, what Keynes argued is that an increase in the interest rate subsumed a fall in bond prices and thus, by substitutability, a fall in the quantity of capital assets demanded. Thus the investment demand schedule was interest-elastic". This is not the same as assumption (ii).
A pleasing result of this dynamic analysis is that a general reduction of money wages will not reduce the level of unemployment. As Lekachman (1969, p75) states: "any observer at all in touch with social reality of the 1930s knew that quite frequently wages and employment had contracted simultaneously". The proposition by Keynes is illustrated by reference to point B. While a real wage overhang is the cause of unemployment, a consequential reduction in the money wage will move the labour market to point Z. Since wages form a significant portion of aggregate demand, firms become quantity-constrained. Lekachman (1969, p77) again explains: "when wages in general fall, then the demand for all varieties of consumer goods and services falls in tune with the declining incomes of workers. At best, then the demand for goods must fall in much the same proportion as wages... One employer can benefit from a reduction of his worker's wages [and therefore costs]. All workers cannot benefit by a general reduction. To believe otherwise is to commit a fallacy of composition." A Neo-Classical scenario is where the economy moves from point B to position E because firms are not quantity-constrained; prices are flexible downwards.
Indeed the liquidity trap does not appear to be a prevalent phenomenon. The distinction between Walrasian and Neo-Keynesian models is not clear.

The imposition of these assumptions is required because of the nature of the framework: i.e. static (or comparative static) analysis. The assumptions are not required within a dynamic disequilibrium framework, where wages become endogenous and are allowed to be flexible but rarely, if ever, reaching equilibrium and thus preserving the existence of Keynesian involuntary (disequilibrium) unemployment. This process is illustrated in diagram 2.6. The implication to reduce involuntary unemployment is not to decrease the real wage by reducing the money wage, but rather to stimulate output. It has been argued that within a static disequilibrium framework, demand for output manifests itself in the labour demand function. Real wages did not enter the demand function because they were fixed, but became relevant in the Neo-Classical framework because they were endogenous. Within a dynamic disequilibrium framework both output and real wages are relevant. Real wages are now endogenous, but may not equilibrate the labour market; this leaves output as a relevant variable.

This is demonstrated in the following diagram, (2.6). For ease of exposition assume that the price is constant at $P_0$. Following Patinkin (1956, 1965), involuntary unemployment is initially given by $ZE$. Assuming that the market dominates the wage determination process, then money wages (and in this example, real wages too) are forced down toward equilibrium. But as this occurs equilibrium may move from $E_1$ to $E_2$. A moving equilibrium is the essence of dynamic disequilibrium which is assumed to be a characteristic of the real world. The estimation procedure, developed in the following section, according to Bowden (1978a), assumes a moving equilibrium. Involuntary unemployment is now $Z_1E_1$. In turn real wages are forced down to $\frac{W}{P_0}$ and involuntary unemployment is given by $Z_2E_2$. Involuntary unemployment has not been eliminated as would be the case in a Walrasian framework; if the reduction in the real wage is accompanied by an increase in aggregate demand, perhaps due to a decrease in product price, then involuntary unemployment would be reduced as point $Z_2$ approaches $E_2$. Sinclair (1987, p68) states: "(New) Keynesian unemployment can be removed by bringing
the price of goods down to its Walrasian level, and correcting the money wage rate if it has also strayed [from equilibrium]". In essence, therefore, involuntary unemployment may exist when wages (both money and real) are flexible. In a pure equilibrium framework real wages enter the labour demand equation, while in a fixed-wage disequilibrium regime output enters the demand equation. When both output and wages are allowed to vary, both wages and output enter the demand equation only within a dynamic disequilibrium framework. The distinction between (New)Keynesian and Neo-Classical scenarios is therefore a matter of degree; the relative speeds of wages and employment toward equilibrium are the criteria for distinguishing between these doctrines.

As previously explained, however, dynamics implies non-optimizing behaviour, and as Hey (1981) remarks, dynamic models require a departure from optimality (i.e. choice-theory). As a consequence models become behavioural and are based on reasonable rules of behaviour. From this perspective, a price equation of the form \[ P_t - P_{t-1} = f(D - S) \] as used by Fair and Jaffee (1971) may be an appropriate appendage to their market model. The thinking behind the equation is simple; if there is excess supply price will tend to fall, and vice-versa. (As pointed out in Section 2.2, using the above price equation in conjunction with the short side rule is inconsistent).

On the other hand, optimality (choice-theory) is not forsaken when a price equation takes the form of the Partial Adjustment Model (PAM). According to Griliches (1967) the basic premise of the PAM is that there are costs to adjustment which justify the observed inertia or sluggishness of endogenous variables, such as employment. The PAM provides a basis for optimal-adjustment theory. Following Griliches (1967), firms incur two costs: (i) the cost of trading in disequilibrium (i.e. forgone profit) and (ii) the cost of change (adjustment). It is not costless, for example, for a firm to adjust its labour stock to variations in product demand; output therefore may vary more than employment. If both cost functions are approximated by quadratics, then the loss function becomes

\[ L = a(S_t - S^e_t)^2 + b(S_t - S_{t-1})^2 \]

where \( S^e_t \) is the desired equilibrium level. Minimizing \( L \) by differentiating with respect to \( S_t \) and setting to zero gives:
\[
\frac{dL}{dS_t} = 2a(S_t - S^e_t) + 2b(S_t - S_{t-1}) = 0
\]

\[\rightarrow S_t = \frac{a}{a+b} (S^e_t) + \frac{b}{a+b} (S_{t-1})\]

\[\rightarrow S_t - S_{t-1} = \frac{a}{a+b} (S^e_t - S_{t-1})\]

\[\rightarrow S_t - S_{t-1} = m(S^e_t - S_{t-1})\]

where \(m = \frac{a}{a+b}\). This states that the higher the adjustment cost the slower the rate of adjustment. Of course, there are other reasons why complete adjustment is not achieved in a single period, such as economic and social institutions (including the conjectural theory as explained in section 2.2), persistence of habit, and poor information flows.

Consequently, in this thesis an economic technique with partial adjustment toward a moving equilibrium is adopted; a partial adjustment equation will replace the equilibrium condition in the labour market (i.e. \(L_s = L_D\)). Both \(L\) and \(W\) will adjust toward equilibrium, but only partially. This technique has been developed by Chow (1983). The Chow (1983) procedure has the advantage of avoiding the use of the short-side rule. The short-side rule implies an unusual asymmetric adjustment. The rule suggests that effective labour demand (\(\overline{L}\)) overshoots the new equilibrium during and economic downturn (Sarantis, 1981, cited in Rao, 1983), but does not overshoot equilibrium during an economic upturn. Suppose, as in Diagram 2.7, the labour demand function shifts to \(L^0D\), then adjustment as dictated by the short-side rule may be from point A to point C. Employment does not overshoot the new equilibrium (J) during an expansionary adjustment phase. In contrast, as the labour demand function shifts to \(L^1D\) effective labour demand overshoots the new equilibrium (G) because employment settles at \(\overline{L}_1\), point A. Other short-comings of this rule have been addressed in previous sections.

If the labour market as dictated by the short-side rule was initially at point C and labour demand shifted to \(L^1D\), the short-side rule again dictates that employment will fall to \(\overline{L}_1\) (point A). This highlights other assumptions underlying the adjustment to point A.
Diagram 2.7

The Labour Market: In Disequilibrium

\[ L_D = \text{Walrasian (notional) labour demand curve} \]
\[ L_S = \text{Walrasian (notional) labour supply curve} \]
\[ \bar{L}_i = \text{Effective labour demand curve, where } i = 1...5 \]
Adjustment of employment by a firm to point A assumes little or no cost to the firm in adjusting its labour stock, and that firms are not sales-constrained (since point A is on the firm's labour demand function).

If there are significant costs to the firm to retrench and re-hire labour, however, then labour may be less sensitive to variations in the demand for output. Firms, therefore, may hoard labour during an economic downturn if they expect the downturn to be temporary. Consequently, a firm may not adjust its labour stock to $L_1$ (point A), but to somewhere in between such as point E; the firm is off its labour demand function. Adjustment to point A assumes that the firm is not quantity-constrained and there are little costs to the firm in reducing labour. Furthermore, adjustment to point E (and A) also assumes no real wage adjustment; if real wages are flexible downwards, since the effective demand for labour ($L_2$ at point E) is less than the notional demand for labour ($L_3$ at point G), then adjustment will lie somewhere between points E and H. Point F implies unconstrained behaviour and point H depicts voluntary unemployment, but this is probably an unstable situation. Any adjustment of labour by firms that does not extend to $L_1$ implies some degree of labour hoarding, which may be defined as the deliberate under-utilization of a firm's labour stock because it may retain more labour than is required to produce a given level of output. In short, assuming: (i) firms are quantity-constrained and therefore operate off their labour demand functions (Patinkin, 1956, 1965); (ii) there are significant costs to firms to adjust their labour stocks; and, (iii) real wages are flexible; adjustment may be from Z to $Z_1$ or somewhere in between.

Therefore, embodied in a partial adjustment equation, unlike the short-side rule, is Patinkin's (1956, 1965) analysis and the theory of labour hoarding. An econometric procedure that employs the partial adjustment equation and discards the short-side rule is theoretically desirable. The Chow (1983) method also provides a method of measuring the relative speeds of adjustment of employment and wages toward equilibrium. In summarizing, Neo-Classical and (New)Keynesian labour market theories are both characterized by non-tatonnement; disequilibrium in turn implies dynamics and therefore the adjustment of the endogenous variables. The distinction between Neo-Classical and
(New) Keynesian economics is a matter of degree. If the real wage adjusts all but instantaneously during a disequilibrium phase, then the labour market may be characterized by a Neo-Classical framework. Underlying a Neo-Classical framework is, perhaps, labour hoarding, since employment is not a significant source of adjustment toward equilibrium. Labour dis-hoarding may allow employment to adjust more rapidly than the price of labour. The econometrics of disequilibrium and Chow's (1983) procedure is discussed in detail in 2.4. Section 2.5, in summarizing this chapter, also discusses labour hoarding in relation to Chow's (1983) estimation technique.

2.4 NON-TÂTONNEMENT ESTIMATION PROCEDURES

The significance of non-tâtonnement economics for estimation is that it will determine the structure, specification and estimation procedure of a model. Econometric models revolve around the multi-equation or single-equation framework, which reflect the equilibrating nature of right-hand side variables (i.e. endogeneity of some variables in a multi-equation framework) or the exogeneity of the right-hand side variables in a single-equation framework.

Trivedi and Baker (1985) criticize the estimation of the expectations augmented Phillips curve of the form:

$$P_t = (U_t - U^e_t) + \alpha P_t^*$$

where $P_t$ and $P_t^*$ denote respectively actual and expected price changes and $U_t$ and $U^e_t$ denote actual unemployment and the Natural Rate of Unemployment (NRU). Briefly, the NRU is given by the intersection of supply and demand curves in the labour market; more precisely the point of intersection of the traditional Phillips curve with the unemployment axis where the rate of price inflation is zero. This may be viewed as a unique case of the Non-Accelerating Inflationary Rate of Unemployment (NAIRU), where a positive (but constant) rate of price inflation is associated with equilibrium in the

---

7 Note that Trivedi and Baker (1985) refrained from using the term NRU as defined by Friedman, because of what they see as vagueness and ambiguities in his definition.
labour market. Positive non-constant price inflation exists when \( U_t \) diverges from \( U^e_t \); thus the term \( (U_t - U^e_t) \) is a surrogate for aggregate demand.

Trivedi and Baker (1985, p630-31) make the point that "since \( U^e_t \) is a general equilibrium concept its solution values ought to be derived from the solution of an economy wide model in which the expectations-augmented Phillips curve is embedded. [Moreover], market clearing assumptions...[make]...results either uninteresting or not meaningful when one wants to obtain the time path of unemployment given sluggish wage-price adjustment and 'continuous' non-marketing clearing".

Assuming the short-side rule, Trivedi and Baker (1985) proceed to estimate a short-run (cyclical) unemployment (\( U^c \)) equation of the general form

\[
U^c = f\left(\frac{W}{We}, \frac{Q}{Q^e}, S, T\right)
\]

where \( S \) and \( T \) denote search and structural unemployment respectively. \( \frac{W}{We} \) and \( \frac{Q}{Q^e} \) capture real wage and output (insufficient aggregate demand) gaps, where \( e \) denotes equilibrium values, and \( W \) and \( Q \) denote observed values. Since \( We \) and \( Q^e \) are unobservable within a disequilibrium framework, measurement difficulties arise. This difficulty is avoided with the Chow (1983) technique which will be developed in the following section. The estimation of \( U^c \) is consistent with Trivedi's and Baker's (1985) objective of measuring cyclical unemployment, which is defined as "the rate of unemployment that would prevail given short-run rigidity of the real wage" (Trivedi and Baker, 1982, pi). The implied framework is static disequilibrium (i.e. SSE). Their objective is to explain short-run variations in \( U^c \). They point out that if real wage and demand variables are sluggish in adjustment then the single equation (as above), which implies exogeneity of right-hand side variables, will yield a fruitful explanation of short-run unemployment. If the real wage and demand (output) variables, however, were treated as endogenous in a Walrasian spirit, additional equations would be required to investigate unemployment fully.

\[8\] Note that this is a simplified version of their equation.
In the long-run, unlike the short-run, it is reasonable to suppose that real wages and aggregate demand variables are endogenous. Yet an estimation technique that proceeds with these assumptions implies that equilibrium is the assumed state. Keynesian theory is not easily tested within such a framework.

As previously argued, however, it is a conceivable and even an accurate interpretation of Keynes, that markets (prices and real wages) do respond to supply and demand in the long-run, but that equilibrium is rarely achieved or that disequilibrium is more the rule than the exception. Lagged endogenous variables may accommodate the sluggish adjustment of markets, but the procedure assumes that Walrasian equilibrium is achieved, albeit in a sluggish manner. This procedure in itself suggests trade out of equilibrium. Real wages may be sluggish in their adjustment because of poor informational flows (exemplified by search behaviour), economic and social institutions. Empirical models that support the sluggish nature of wage and employment adjustment in the labour market are Lewis and Makepeace (1981, 1984), Smyth (1983) for the U.K., and both Jonson, Battellino and Campbell (1978) and Lewis and Makepeace (1985) for Australia.

A basic model of the labour market in disequilibrium is specified below:

**BASIC MODEL**

\[
\begin{align*}
Q_D &= d(P_t, X^{D_t}) + e_D \\
Q_S &= S(P_t, X^{S_t}) + e_S \\
P_t - P_{t-1} &= f(Q_D - Q_S) + e_p \\
Q_t &= \min (D, S)
\end{align*}
\]

where:

- **D, S** = Notional demand and supply for Q (unobserved).
- **P, Q** = Observed price and quantity in current time period.
- **X^{D_t}, X^{S_t}** = Exogenous demand and supply variables respectively.
- **e_D, e_S, e_p** = Error terms with Normal Classical assumptions.

---

9 The symbols P and Q are used here in a general sense, so that P may refer to W, and Q may refer to L.
Without equation (5), price is assumed to be exogenous. This basic model where adjustment is free of error (\( e_p = 0 \)) was first estimated by Fair and Jaffee (1972). Equations (5) and (6) have been discussed in Section 2.2. According to Fair and Jaffee (1972, p497) "the main problem of estimation is that in the absence of an equilibrium condition the observed quantity traded in the market may not satisfy both the supply and demand schedule" (i.e. \( Q_e \neq Q_D \neq Q_S \)). Fair and Jaffee (1972) applied the maximum Likelihood Method (MLM) to their model, as it was appropriate in determining the optimal apportionment of a sample of observations into demand and supply regimes.

Since this path-breaking article, subsequent literature which extends and modifies Fair's and Jaffee's (1972) basic model has evolved. Fair and Kelejian (1974, p177) state that the price-adjustment equation embodies a "rather strict assumption about price setting behaviour, namely that price changes are strictly proportional to excess demand". Consequently, the error term (\( e_p \)) was included. Also the price-adjustment equation can be generalized into a multivariate equation. Fair and Kelejian (1974) investigated the following equation:

\[
P_t - P_{t-1} = f(Q_D - Q_S) + X^P + e_p
\]

where \( X^P \) is a cost variable. This is realistic since, in oligopoly theory, prices respond to unit normal cost, which is affected by excess demand. Analogously, a wage-adjustment equation may be augmented by a price variable. The inclusion of the error term (\( e_p \)) makes MLM complicated, and possibly irregular and unbounded for certain combinations of the parameter values\( ^{10} \). This shortcoming has been echoed by Maddala and Nelson (1974), Rao (1983) and Bowden (1978a).

Bowden (1978a) respecifies this basic model and allows for an investigation into the problem of testing a model for equilibrium or disequilibrium. Equilibrium in the basic model corresponds to \( f = \infty \) since \( f \) may assume any value other than zero, but adjustment becomes non-operational when \( f = 0 \). This implies that various degrees of equilibrium are described between zero and infinity. There is, therefore, no statistical test

\( ^{10} \) See Chow (1983) for proof of this, p244-246
for degrees of disequilibrium, since there are no upper or lower boundaries. In other
words the value that f takes on, when estimated, is not bounded. Bowden's (1978a)
reformulation of equation (5) allows for a measure of drag, m, otherwise known as the
coefficient of friction. Briefly, Bowden (1978a) introduces an unobservable price
variable (P^e_t) in place of P_t in the supply and demand equations. P^e_t is the unobservable
equilibrium price. It is the market clearing price. Equation (5) is reformulated as:

\[ P_t = mP_{t-1} + (1-m)P^e_t + \epsilon_p \]  

(8)

where \((P_t - P_{t-1})\) is the actual adjustment and \((P^e_t - P_{t-1})\) is the required adjustment to
equilibrate the market. Bowden (1978a, p93) describes equation (8) as a partial moving
equilibrium model (PAMEQ). "Prices adjust each period partially to the moving
equilibrium P^e_t." (Bowden, 1978a, p83). For the market to be in continuous
equilibrium, then \(P_t = P^e_t\). In terms of the coefficient of drag, when \(m = 0\), the limiting
case of instantaneous adjustment occurs. When \(m = 1\) there is no response by the
market. The model is now bounded, or in other words, has defined limits ranging from
zero to unity. If \(0 < m < 1\), only a proportion of any difference between actual and
desired balances is made up within any one time period.

Smyth (1983) estimates Bowden's PAMEQ model for the U.K. for the period
1920 - 1938. An unemployment variable was included in the supply equation which,
according to Smyth (1983), is in accordance with the Neo-Classical doctrine. This is the
same estimation period used by Benjamin and Kochin (1979), who argue that
unemployment benefits significantly raised unemployment levels in the U.K. Smyth
(1983) used the MLM (although Bowden's model can be adapted to accommodate other
estimation procedures\(^{11}\)). He found that by imposing the constraint \(m = 0\), the
constrained equilibrium version was rejected in favour of a disequilibrium framework.
Furthermore, Lewis and Makepeace (1984) rejected the hypothesis that the British labour

\(^{11}\) See Bowden (1978) for an overview of various disequilibrium estimation techniques. Note that
Bowden's generalized adjustment procedure is similar to Chow's (1983) technique.
market has been in equilibrium. Interestingly, Smyth (1983) confirmed Benjamin’s and Kochin’s (1979) conclusion, and further concluded that a reduction of unemployment benefits by about half (during the period 1925-1938) would have increased employment by between 8% and 12%.

The analysis thus far has been concerned with one market in disequilibrium. Ito (1980) presents a multi-market model in which spillover effects of excess demand or supply in one market affect another market. He presents a model with labour and output markets, and demonstrates various estimation procedures (MLM, two-stage least squares) reflecting different pricing schemes.

Common to all models was the assumption of the short-side rule: \( Q = \min (D, S) \). This rule, as briefly touched upon, has some theoretical shortcomings, since it implies that there is no problem in information flows and this is not a characteristic of labour markets where there exists search unemployment due to poor information flows. The rule is appropriate only where prices (wages) are fixed institutionally; that is, where prices and wages are not endogenous. Models with price-adjustment equations and the short-side rule therefore represent an odd mix, although they have met with some empirical success. As explained in section 2.2, using a price equation in conjunction with equation (6) is inconsistent. Another shortcoming is that it does not allow for both price and quantity adjustment. This is unfortunate, since the main focus of (dynamic) disequilibrium economics is that quantities are a significant source of adjustment. An estimation procedure where both price and quantities are endogenously determined (allowed to adjust) is desirable, since their relative speed of adjustment may be measured.

Chow (1983, p246) states: "if price and other economic variables are allowed to adjust toward an equilibrium specified by a set of simultaneous equations one can choose the following model":

\[
AY^e_t + BX_t = E \tag{9}
\]

\[
Y_t - Y_{t-1} = M(Y^e_t - Y_{t-1}) \tag{10}
\]
where
\[ Y_e^t = \text{Vector of unobserved current endogenous equilibrium variables.} \]
\[ Y_t = \text{Vector of observed endogenous variable in current time period.} \]
\[ X_t = \text{Vector of observed exogenous variables in current time period.} \]
\[ A, B, M = \text{Matrices of coefficients.} \]
\[ E = \text{Error terms with Normal Classical assumptions.} \]

The equilibrium values are unobserved because, like Bowden's PAMEQ, the equilibrium is moving. Since the system has two equations and one unknown \( (Y^e_t) \), it can be algebraically manipulated for estimation purposes, so that all variables are observable. Solving for \( Y^e_t \) in (9) allows for a substitution with (10) which conveniently removes the unknown. Equation (9) becomes:
\[
Y^e_t = A^{-1}(-BX_t + E)
\]
and after expanding:
\[
Y^e_t = -BA^{-1}X_t + A^{-1}E
\]
Substituting 11 into 10 yields:
\[
Y_t - Y_{t-1} = M(-BA^{-1}X_t + A^{-1}E - Y_{t-1}),
\]
which can be solved now for \( Y_t \), as this is the usual position for a current endogenous variable in regression:
\[
Y_t = -BA^{-1}MX_t + MA^{-1}E - MY_{t-1} + Y_{t-1}
\]
Factorizing gives:
\[
Y_t = Z_1 Y_{t-1} + Z_2 X_t + \epsilon
\]
where
\[
Z_1 = (I-M)
\]
\[
Z_2 = -BA^{-1}M
\]
\[
\epsilon = MA^{-1}E
\]

The estimation procedure revolves around (11), (12) and (9). It is assumed that \( M \), the adjustment matrix, is diagonal and some of its elements are unity. The first step in the estimation procedure is to apply ordinary least squares (O.L.S) to obtain \( Z_1 \) and \( Z_2 \).
These estimates are used to generate (that is, forecast within the sample period) estimates of \(Y^e_t\) through (11). In forecasting, the error term is assumed to be zero (\(A^{-1}E = 0\)). The estimated observations of \(Y^e_t\) are then used in (9) to run an appropriate regression technique: OLS, 2SLS, or three stage least squares (3SLS). The estimates of \(-B\) and \(A^{-1}\) are, as noted by Chow (1983), consistent. Chow (1983) further remarks that \(Y^e_t\) itself in equation (10) may be lagged and \(M\) may be specified with other variables. However, Chow (1977), cited in Rao (1983), notes that lagged endogenous variables in (9) may render (M) unidentifiable, but these lags are unnecessary because the functional form of equation (10) is that of the 'partial adjustment model' (P.A.M.), which captures the sluggish nature of price and quantity adjustments.

The advantage of Chow's (1983) procedure over Bowden's (1978a) and other procedures is that the short-side rule is not employed, that is, quantities and prices are both a source of adjustment. Moreover, underlying the P.A.M equation, as developed by Griliches (1967), is a choice-theoretic foundation of optimizing behaviour by economic agents in a dynamic disequilibrium framework. Furthermore, since the short-side rule has been discarded, it can be assumed that firms may be quantity-constrained which is consistent with non-tâtonnement, because contrary to the implications of the short-side rule, firms may not operate on their labour demand curves. Finally, partial adjustment also implies the theory of labour hoarding; the short-side rule implies that there are no costs to the firm when it alters its stock of labour.

### 2.5 LABOUR HOARDING AND PARTIAL ADJUSTMENT

Historically, employment has varied less than output over the trade cycle, so that labour productivity is high during output peaks and low during troughs. Labour productivity tends to fall, (i.e. exhibit diminishing returns), during a downswing of the business cycle and rise, (i.e. exhibit increasing returns), in an upswing. That is, labour productivity moves pro-cyclically over the trade cycle. This contradicts the theoretically-expected result of diminishing returns during an upswing. As firms, during an upswing,
add (employ) more labour to a fixed capital stock, labour productivity is expected to decline (i.e. exhibit decreasing returns).

The presence of (fixed) adjustment costs of hiring and displacing labour provides a partial buffer to labour adjustment following an economic downturn. A firm need not adjust labour immediately following a decline in the marginal value product of labour consequent on a decline in sales (or product demand). The firm will wait to consider if the downturn is permanent before it displaces labour. If the downturn was temporary and labour was laid-off, then the firm will again have to incur the fixed costs involved in re-hiring and training labour. This solves the apparent puzzle of increasing returns to labour in an upswing. During downturns the adjustment costs of labour slow or even prevent labour displacement, thus lowering labour productivity. In the upswing, firms utilize unused labour time, thus raising labour productivity; consequently, labour productivity moves pro-cyclically over the trade cycle.

One of the early attempts to accommodate adjustment costs in a short-run demand for labour was that of Brechling (1965) where:

\[ N^e_t = f(Q_t) \]  
\[ N_t - N_{t-1} = \lambda(N^e_t - N_{t-1}) \]  

\( N^e_t \) is desired or equilibrium employment, and \( N_t \) adjusts according to equation (2); \( Q_t \) denotes current output. As \( N^e_t \) is unobserved, (1) is substituted into (2) to yield:

\[ N_t - N_{t-1} = \lambda(f(Q_t) - N_{t-1}) \]  
\[ N_t = \lambda f(Q_t) + (1 - \lambda)N_{t-1} \]  

The sluggish nature of adjustment is given by \( (1 - \lambda)^2 \). Adjustment is instantaneous if \( \lambda = 1 \). Note, however, that the model does not allow explicitly for a labour supply

\[ \text{The coefficients of} \ f(Q_t) \text{can be obtained via estimates of} \ (1 - \lambda) \text{and} \ \lambda \]
equation. This highlights a further advantage of Chow’s (1983) generalized technique. Specifying a supply equation is desirable, especially in the long-run. The specification of a supply function will be more apparent in Chapter 3.

Also the Chow (1983) technique of estimating markets in (dynamic) disequilibrium was found to embrace optimal-adjustment paths (Griliches, 1967), labour hoarding (where M captures the speed of adjustment) and Patinkin’s (1956, 1965) analysis. The implicit assumption of price and quantity adjustment during a disequilibrium phase also avoids the use of the short-side trading rule, which was found to have a number of shortcomings. The technique further avoids the specification of effective supply and demand curves, and consequently the problems of making spillover effects explicit.

To specify a model using effective labour supply and demand functions requires reformulating a firm’s production function and budget constraint so that the firm cannot sell all the output it desires; firms are constrained in the output market. Difficulties in selling output in the product market will spill over into the labour market as a reduction in the demand for labour. Specifying these spillover effects becomes theoretically and econometrically cumbersome; the form of the spillover is the subject of considerable debate. For a rigorous discussion on spillover effects and estimation see Honkapohja and Ito (1985).

In adopting the partial adjustment equation, it is assumed that M, the speed of adjustment coefficient for wages and employment, is constant and is not influenced by the direction or movement of the economy. This in turn implies symmetric adjustment for both wages and employment by firms. Symmetric adjustment of labour by firms is where the rate the firms adjustment of labour is the same for an economic upturn (hiring) as it is for an economic downturn (lay-offs). Asymmetric adjustment, for example, is where the rate of employment is adjusted more during an economic upturn than in a downturn.

Assuming that the cost of adjusting labour is dependent on the state of the labour market, the speed of adjusting labour by firms should vary over the business cycle. In
this procedure, however, \( M \) is a constant coefficient and, thus the estimated value that \( M \) takes on will not change over the business cycle. In the case of an economic downturn, firms experience increasing adjustment costs by laying off labour, then downward adjustment of labour would slow down when unemployment is higher. This implies that \( M \), with respect to employment, should not be constant or that the speed of adjustment need not be symmetric.

If labour recruitment and lay-offs are somehow a function of labour market tightness, then the adjustment coefficient \( M \) should be made a function of such tightness in the labour market; the unemployment rate, as cited in the literature on disequilibrium, is a natural candidate to represent such tightness. Variation in unemployment, however, may not capture such tightness if variation in unemployment is primarily due to changes in \( U^e_t \), the natural rate of unemployment. As Chow (1983) points out, \( M \) can be made a function of other variables and hence will no longer be a constant.

Hazeldine (1979), Briscoe and Peel (1975), Thomas and Deaton (1977), and Muellbauer (1978) all suggest the presence of an asymmetric labour adjustment over the business cycle. Earlier studies, such as Hawkins (1971) and Fair (1969), made their adjustment coefficient (\( \lambda \) in equation 2) a function of the unemployment rate in an attempt to capture asymmetric adjustment of labour by firms (cited in Hazeldine, 1979). Hazeldine (1979) remarks, however, that there is no clear evidence, especially for Canadian manufacturing as a whole, of asymmetric labour adjustment. What is important, however, is that the partial adjustment equation accounts for the apparent contradiction of theory with observed reality. The form of Chow's (1983) partial adjustment equation is the same as Griliche's (1967) and Brechling's (1965) partial adjustment equation for employment. Chow's (1983) is a generalized partial adjustment equation; this becomes more apparent by expanding the endogenous vectors \( Y_t \) and \( Y^e_t \) for a labour market:

\[
N_t - N_{t-1} = b_1(N^e_t - N_{t-1}) \quad (4a)
\]

\[
W_t - W_{t-1} = a_1(W^e_{t} - W_{t-1}) \quad (4b)
\]
Since both endogenous variables as dictated by equation 10 in the previous section are allowed to adjust during the disequilibrium phase, (4) becomes:

\[ N_t - N_{t-1} = b_1(N^e_t - N_{t-1}) + b_2(W^e_t - W_{t-1}) \]  \hspace{1cm} (5a)

\[ W_t - W_{t-1} = a_1(W^e_t - W_{t-1}) + a_2(N^e_t - N_{t-1}) \]  \hspace{1cm} (5b)

The coefficient \( M \) implies symmetric adjustment of the real wage; if the real wage is rigid downwards then this is an inappropriate assumption. The Patinkin (1956, 1965) analysis, however, allows for a downward adjustment of the real wage; although downward adjustment may well be slower than upward adjustment. The PAM equation, and its implied assumption of symmetric adjustment, is thought to be theoretically adequate, since it overcomes an inconsistency of theory with reality and there is no overwhelming evidence of asymmetric labour adjustment for manufacturing as a whole.

From a Classical perspective \( Q_t \) should be replaced with real wages \( W_t \) but as Hazeldine (1979, p11) points out, "it seems to be just not possible to get good fits without including a quantity demand variable" in the demand function. Indeed, this may be a manifestation of disequilibrium, since in disequilibrium output becomes an explicit variable that at least partly explains unemployment. Symons and Layard (1984, p788) suggest that "if product markets are competitive and firms operate on their demand curves, employment should be explained by real factor prices (relative to product prices), the capital stock and the state of technology". With classical assumptions, output would not enter the labour demand function explicitly while real wages would. Output in the product market, in other words, is never constrained, in that firms can sell as much as they produce. Within a (New)Keynesian framework, however, firms may not operate on their labour demand curve; they may be quantity-constrained. Thus, in following Patinkin (1956, 1965), output also becomes an explicit variable. A long-run labour demand function (where wages are not fixed) will have as explicit variables, both output and real wages. Briefly, with (New)Keynesian theory, unlike Neo-Classical, less than full employment will occur without institutional rigidities.

It has been demonstrated in this chapter that within a Walrasian framework Neo-Classical and Neo-Keynesian doctrines are very similar; in particular there is no clear
distinction between the theories if wages are allowed to be flexible. Indeed, within the (New)Keynesian theory a reduction in the real wage does not necessarily cure involuntary unemployment, but it does in a Walrasian framework; (i.e. both Neo-Classical and Neo-Keynesian). The superficial distinction between Neo-Classical and Neo-Keynesian theories has been maintained by making the assumption, among others, of rigid money wages. Indeed this assumption can also be perceived as Neo-Classical in character. Using Chow's (1983) disequilibrium procedure to estimate Neo-Keynesian unemployment would be inappropriate, because the wage rate, an endogenous variable, is assumed to be rigid.

A disequilibrium framework, and hence Chow's (1983) procedure, embraces both (New)Keynesian and Neo-Classical theories. Importantly, within a dynamic disequilibrium framework, where wages are endogenous and therefore considered flexible, a distinction between Neo-Classical and (New)Keynesian theories still emerges. Since both theories (as argued here) are a manifestation of disequilibrium they can be placed on a continuum where both prices and quantities adjust to equilibrium, particularly in the long run. At one extreme where quantities (labour) may adjust more rapidly than prices (wages) we have a (New)Keynesian phenomenon. At the other end of the continuum where prices react more rapidly than quantities, we have a Neo-Classical scenario. The paper now turns to specifying and estimating an unemployment model using Chow's (1983) generalized partial adjustment technique.
CHAPTER 3

THE MODEL: AN INTRODUCTORY ANALYSIS

3.1 THE MODEL SPECIFIED

The model presented below revolves around five equations. Equation (5), which is Chow's (1983) generalized model, has been extensively developed in previous sections. The unemployment equation (1) is placed in a system of equations because wages are assumed to be endogenous. Involuntary unemployment stems from a labour market in disequilibrium; hence \( N^e_t \) and \( W^e_t \) are assumed unobservable in equations (3) and (4), which together comprise the labour market. Equation (3) provides the link between the labour market and unemployment. The assumption is that \( W^e_t \) will influence \( W_t \), but not to the extent where \( W^e_t = W_t \). Otherwise \( N^e_t \), from a Classical perspective, will be observable and unemployment will be all voluntary.

1: The unemployment equation
\[ U_t = u(W_t, Q_t, S_t, T_t) + E_t \]

2: The wage equation
\[ W_t = w(AW_t, W^e_t, P_t, U_t, B_t) + E_t \]

3: The labour demand function
\[ N^e_t = d(W^e_t, Q_t, K_t) + E_t \]

4: The labour supply equation
\[ N^e_t = s(W^e_t, L_t, U_t) + E_t \]

5: The system is closed by
\[ Y_t - Y_{t-1} = M(Y^e_t - Y_{t-1}), \]
where
\[ Y_t = \begin{pmatrix} N_t \\ W_t \end{pmatrix}, \quad Y^e_t = \begin{pmatrix} N^e_t \\ W^e_t \end{pmatrix}, \quad M = \begin{pmatrix} b_1 & b_2 \\ a_2 & a_1 \end{pmatrix} \text{ and } Y_{t-1} = \begin{pmatrix} N_{t-1} \\ W_{t-1} \end{pmatrix}. \]
The above model was estimated over two time periods to provide a comparison between these two periods. Period I (PI) is the first quarter of 1964(1) to the third quarter of 1972(3). Period II (PII) covers the fourth quarter of 1972(4) to the second quarter in 1986(2). The decision to end the first period at 1972(3) is based on the fact that the classifications of industries changed in 1972(4). Consequently, since the variable \( T_t \) requires employment statistics from various industries, the index \( T_t \) was constructed over the two separate periods as mentioned above. This is not unfortunate, because unemployment became more volatile after the early 1970s. An introductory discussion of each equation for both periods is presented below.

### 3.1.1 The Unemployment Equation: \( U_t = u(W_t, Q_t, S_t, T_t) + E_t \)

The equation, while of a simpler form, is in keeping with Trivedi and Baker (1982, 1985). \( S_t \) is the ratio of \( B_t \) and \( W_t \): the higher the ratio the larger will be the
number of persons searching for work. Then a priori, the sign on \( S_t \) may be expected to alter between periods.

Friedman's model of frictional unemployment incorrectly predicts that the quit rate falls during a boom and rises during a recession (Kennedy, 1979). A job search scenario becomes more credible if, in the short-run, job search activity tends to rise when unemployment is low. This is depicted in Diagram 3.1, where \( U_t \) and \( SAt \) denote the unemployment rate and search activity respectively, and \( SU \) is the search-unemployment curve which embodies the inverse relationship between \( SAt \) and \( U_t \). The inverse relationship is consistent with the concept of full employment-unemployment. That is, search unemployment is a constraint upon achieving 100% employment. The a priori sign on \( SAt \), however, needs careful consideration. While there exists a negative relationship between \( U_t \) and \( S_t \), there is a positive relationship between \( S_t \) and \( SAt \). Consequently, there exists a negative relationship between \( S_t \) (which is the cost of \( SAt \)) and \( U_t \). Assuming that \( B_t \) has declined (relative to \( W_t \)), which most certainly occurred during the first period, then the coefficient on \( S_t \) may have a positive sign. However, if \( B_t \) has risen (relative to \( W_t \)), which is thought to be the situation in the second period, then \( S_t \) may yield a negative sign.

More will be said about \( B_t \) in relation to the wage equation, but for the moment a reversal of signs on \( S_t \) will be assumed to indicate a change in search behaviour. A positive sign (expected) on \( PI \) suggests that \( SAt \) is at or close to its irreducible minimum (since \( B_t \) is expected to be small or insignificant relative to \( W_t \)). A negative \( S_t \) (expected) in \( PII \) will suggest an increase in search activity.

Traditionally, search unemployment is considered as non-demand deficient unemployment\(^1\). The other non-demand deficient unemployment considered is structural unemployment; specified as \( T_t \). The \( T_t \) index is constructed from the following formulae:

\[
T_t = \sum_{i=1}^{D} \left| \hat{N}_{it} - \overline{N}_t \right| \left( \frac{\hat{N}_{it}}{N_t} \right)
\]

where, \( \overline{N}_t = \sum_{i=1}^{T_t} \hat{N}_{it} \left( \frac{N_t}{N_t} \right) \)

\(^1\) This is not strictly true. All types of unemployment are affected by demand factors.
Diagram 3.1

Search-Unemployment Curve

$U_t$ = Unemployment rate
$SA_t$ = Search Activity
$SU$ = Search-Unemployment curve. That is, there is an inverse relationship between $SA_t$ and $U_t$. 

and the subscript t denotes current time period. N_t is total employment in D industries and N_{it} is employment in industry i. The dot refers to the rate of change, while \overline{N}_t denotes the weighted average rate of change of employment for all industries. As Stoikov (1966, p54) says the index (T_t) "is a measure of demand dispersion that occurs from [time period to time period]. If there were not relative shifts in demand for labour between industries then individual deviations from the all-industry average rate of change of employment would be zero. The greater the relative shifts of demand the larger the index. The individual deviations [of labour demand] from the average rate of change are weighted by the relative employment of the industry in question in order to take account of industries with different employment volumes".

The index attempts to capture a mismatch in labour skills demanded and supplied. In Australia, where there exist distinct segmented labour markets, changes in the cyclical demand for labour will lead to a divergence in the supply and demand of labour skills. This assumes that there exists:

i) costly and imperfect labour mobility between industries and geographic regions;

ii) changes in the composition of consumer demand and technology (manifested as a change in the nature of capital), and hence also in the composition of production; and

iii) regional shifts of both industry and labour (i.e. in both labour supply and demand).

Technology has been singled out as the underlying cause of the divergence between the demand for and supply of labour skills. In the short-run, holding all other factors constant, the adoption of new technology may lead to a mismatch of labour skills demanded and supplied. In the long-run, however, if the economy is expanding and efficient in adjusting resources quickly when supply and demand shifts, then it is less certain that a divergence between labour skills demanded and supplied will cause persistent unemployment. Specifically, whether T_t shows up as a significant explanation of U_t will depend on the output and substitution effects of replacing labour with capital;
in the short-run and for a particular industry the adoption of labour-saving capital will reduce employment, assuming that output has not risen to compensate for the substitution effect of labour for capital. Perhaps for the economy as a whole and in the long-run the assumption of constant output is not valid; indeed the adoption of capital raises the productivity of those employed, thus providing a stronger demand for labour in an expanding economy. More will be said about structural unemployment in reference to \( K_t \) in the labour demand equation. For the moment, however, the expected sign on \( T_t \) in the unemployment equation is negative in both periods.

The variables \( W_t \) and \( Q_t \) enter the equation as arguments, since it has been demonstrated that \( U_t \) is partly a disequilibrium phenomenon. The variables in themselves are not sufficient to distinguish between (New)Keynesian and Neo-Classical unemployment, either from a theoretical or from a statistical point of view. Multicollinearity will not bias the estimates, but it will lead to an increase in the variances of the estimates; \( W_t \) and \( Q_t \) are included for theoretical completeness. The a priori signs on \( W_t \) and \( Q_t \) are positive and negative respectively. To allow for the long-run endogeneity of \( W_t \) the unemployment equation is placed in a system of equations.

### 3.1.2 The Wage Equation: \( W_t = w(AW_t, W^e_t, P_t, U_t, B_t) + E_t \)

The (disequilibrium) wage equation provides the link between the unemployment equation and the labour market via the unobserved explanatory variable \( W^e_t \). This variable is a measure of labour market tightness, but its sign and significance is difficult to predict in relation to the disequilibrium wage \( (W_t) \). (Detailed discussion of this variable is left to Section 4.2.) The remaining arguments of this equation are addressed in the following discussion; what will evolve from the ensuing discussion is the expected sign on the other variables \( (P_t, U_t, B_t, AW_t) \).

Traditionally, during the upturn of a trade cycle price levels increase \( (P_t) \) and unemployment levels \( (U_t) \) fall. If these variables enter the wage equation as follows;

\[
W_t = f(P_t, U_t) \quad \text{where} \quad \frac{\partial W}{\partial P} > 0 \quad \text{and} \quad \frac{\partial W}{\partial U} < 0
\]
then $W_t$ would exhibit pro-cyclical behaviour with the trade cycle, which is consistent with Patinkin's (1956, 1965) disequilibrium analysis of the labour market. A low or declining $U_t$ reflects a tight labour market which may explain the pro-cyclical nature of $W_t$. Union activity too, may facilitate this behaviour.

Conversely, if $P_t$ and $U_t$ enter the wage equation as:

$$\frac{\partial W}{\partial P} < 0 \text{ and } \frac{\partial W}{\partial U} > 0$$

then $W_t$ will not move pro-cyclically with the trade cycle. This behaviour of $W_t$ is consistent with a Walrasian/Classical model of the labour market. As output expands the resultant rise in $P_t$ will lower $W_t$ (and hence raise the demand for labour and lower the supply of labour). Briefly, during the upturn of a trade cycle $P_t$ may be rising (and $U_t$ declining) while real wages ($W_t$) are declining. The implication for unions is that they:

i) suffer from money illusion if price increases are imperceptible; or

ii) accept a real wage reduction in return for job security and high levels of employment. That is, money illusion is forced upon unions. In terms of wage claims unions therefore may well be passive.

If $P_t$ and $U_t$ enter with identical signs then the traditional relationship between these variables may no longer exist. The two possibilities are:

i) \[\frac{\partial W}{\partial P} < 0 , \quad \frac{\partial W}{\partial U} < 0\]

or

ii) \[\frac{\partial W}{\partial P} > 0 , \quad \frac{\partial W}{\partial U} > 0\]

The implication is that a positive relationship between $U_t$ and $P_t$ exists, as opposed to the traditional inverse relationship; the traditional relationship between $P_t$ and $U_t$ suggests a stable Phillips Curve.\(^2\) When $P_t$ and $U_t$ are of identical signs then either:

i) the Phillips Curve is unstable; or,

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\(^2\) I realize that the original Phillips Curve has on its vertical axis the rate of increase in money wages. The aim of this paper is not to analyse the Phillips Curve, but the implication is there.
ii) a short-run Phillips Curve relationship does not exist unless defined in terms of money wages.

Positive signs suggest a positive (or pro-cyclical) relationship with $W_t$. When the signs on $P_t$ and $U_t$ are negative this suggests an inverse relationship with $W_t$; for instance, if $P_t$ (and $U_t$) are rising there is a reduction in real wages ($W_t$). This relationship between $P_t$ and $W_t$ implies that union activity with respect to real wages may be a function of $U_t$, so that rising unemployment levels ($U_t$) are sufficient to dampen union activity. On the other hand if $P_t$ (and $U_t$) are positive then real wages move pro-cyclically and are rising or at least being maintained or rising.

Taking the analysis a little further, for actual real wages to at least equal the equilibrium real wage ($W^e_t$), there would be no lags in adjustment of money wages to a price change. Otherwise real wages will be suppressed below $W^e_t$, even though both prices and real wages are rising over time. For example, if the economy is initially in equilibrium at position $E$ in diagram 3.2, which designates full employment with real wages initially denoted by $\frac{W^0}{P^0}$, an increase in aggregate demand increases prices from $P_0$ to $P_1$. This lowers the real wage to $\frac{W^0}{P_1}$ (Step 1a). At $\frac{W^0}{P_1}$ there is excess demand for labour (given by $OL_1 - OL_2$); this in turn will probably raise money wages from $W^0$ to $W^1$. However, if inflation is validated then $P_1$ will rise to $P_2$, keeping the actual real wage below $E$ (step 2).

If money wages, however, adjust instantaneously to the price rise (Step 1b) then $W_t = W^e_t$. If money wages rise faster than $P_t$ then real wages will rise, possibly above point $E$. If there were no lagged response of money wages then the current value of $P_t$ may be expected to be positive and significant. The Arbitration Commission’s decisions will play a role in determining the value of $P_t$ in relation to $W_t$. If a change in award wages ($AW_t$) is equal to $P_1 - P_2$ then real wages will be maintained. Indeed, real wages may lie above $W^e_t$. A positive $W^e_t$ suggests that the market is exerting an influence; in a
Diagram 3.2
A Labour Market: Real Wages Suppressed

Note: To illustrate the reverse of Patinkin’s (1956, 1965) analysis where there is excessive production and hence over-full employment requires a movement to point B. However, to show also the co-existence of a real wage underhang is unduly awkward within this framework. This diagram is presented as it more clearly illustrates how actual real wages may remain below equilibrium values. This analysis is a preparation to understanding Keynes’ theory of inflation which is presented in Section 4.3.
dynamic model, a changing W_{e,t} will drag W_t with it if the market is exerting an influence.

Moreover, during Period II Australia experienced wage indexation from 1975 to 1981 and again in 1983. Perry (1983), cited in Veale et. al. (1983), states that although the arbitration system may have been a rubber stamp in terms of ratifying collective bargaining agreements outside the arbitration system, this ratification of awards flowed on quite rapidly to increase other minimum award wages. Indeed, "from 1971 to 1975 the increase in award wages was much greater than the rate of productivity growth (usually between 2 and 3 per cent per year) combined with the rate of growth of prices; [these] two variables are the usual grounds for an increase in award wages...In real terms award wages grew by an unprecedented 13.85 per cent in 1974. It is difficult to explain such increases in terms of demand-pull" (Ibid, p137-38). Moreover, according to Mitchell (1985, p7), "if the return to wage indexation in 1983 has again locked in the previous effects of the 1981-82 wage explosion then the associated level of unemployment could well be locked in by the same mechanisms that were used in the 1970’s".

In Period I, a priori, the relationship between W_t and U_t should be significant and as suspected may be insignificant in Period II. In Period II, as discussed, W_t may well be determined by factors other than supply and demand for labour, such as award wage (AW_t) decisions in line with rises in the price level, P_t. It is thought that union aggressiveness in terms of real wage maintenance is another factor in explaining the relationship between W_t, AW_t, P_t and U_t. The sign on U_t is difficult to predict in period II. If institutional factors interrupt the link between W_t and U_t, then the relationship between these two variables may prove to be insignificant. In Period I, with smaller price movements, unions were perhaps less concerned with maintaining the real wage.

Finally, P_t is assumed to be exogenous because Cronin (1984), citing a number of macroeconomic studies, states that prices are not very sensitive to demand conditions. Price insensitivity is also consistent with oligopoly theory. On the other hand the
exogeneity of the level of real unemployment benefits ($B_t$) is less certain. Briefly, it may be that an increase in the level of $B_t$ raises the reservation wage of the unemployed. The expected sign on $B_t$ (assuming that $B_t$ leads to $W_t$) will be positive. This may have occurred in PII. The implication is that the rise in the level of $B_t$ will cause a rise in $S_t$, indirectly $U_t = f(B_t)$; however it is also reasonable to assume that $B_t = f(U_t)$. The rising numbers of the unemployed lead, via political activity, to a rise in the level of $B_t$. It is important to note, however, that $B_t$ lies in the wage equation, which will help to determine the direction of causation. If the coefficient on $B_t$ is positive (and significant) then actual $W_t$ is raised because of a rise in the reservation wage. If the coefficient on $B_t$ is negative, which may be expected to occur in PI because $B_t$ changed very little during the 1960s, then $W_t$ will fall. Consequently, the sign (and significance) of $B_t$ may provide a simple test of causation.

Summarizing, if one supposes that the Arbitration Commission and unions dominated the wage-determination process, (especially in PII), then the coefficient on $P_t$ and $AW_t$ may be expected to be positive and significant, perhaps over-shadowing the impact of $W^e_t$. In PI there may have been over-full employment, and current price levels ($P_t$) may not have been a significant explanatory factor in determining $W_t$. This implies a lagged response of money wages to current price changes. In PI the Arbitration Commission may have imposed a lagged response, while in PII the institutional setting was such as to remove a lagged response of money wages to $P_t$. Unions too, in PI, may have been passive, as previously discussed, so that a lagged adjustment of money wages was probably not union induced.

3.1.3 **The Labour Demand Function:**

$$\text{The Labour Demand Function: } N^e_t = d(W^e_t, Q_t, K_t) + E_t$$

The demand equation follows Rosen and Quandt (1978), except that capital stock ($K_t$) figures were generated\(^3\) and used instead of the simple time proxy. Time captures

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\(^3\) See data source pp.118-19 for construction.
all factors rather than capital specifically. Rosen's and Quandt's (1978) demand function is derived from a profit maximization assumption. Thus, the firm will maximize profit given disequilibrium values, along the lines of Patinkin's (1956, 1965) analysis. Given disequilibrium values, the objective of the firm is to maximize profits, although actual maximized profit within disequilibrium will be lower than the level of maximized profits at traditional static equilibrium. The sign on $K_t$ is again difficult to determine a priori. Its inclusion is relevant in a long-run analysis, for in the long-run the firm has the opportunity to change factor combinations of $K_t$ and labour ($N_t$).

It would be strongly suspected that the coefficient on $K_t$ will be positive, if a change in $K_t$ (both in quantity and nature) is labour-augmenting. Given stable participation rates the sign on $T_t$ in the unemployment equation may be negative (and insignificant) to be consistent with a positive $K_t$ in the employment equation. This implies little or no labour displacement when firms adopt capital, and hence little change in structural unemployment. If the acquisition of capital displaces labour, and output does not rise to compensate the decrease in employment, then $K_t$ will be negative. Presumably, the displaced workers no longer have the appropriate skills, and therefore may be considered to be structurally unemployed; $T_t$ in the unemployment equation would be positive. In short, the signs must be opposite to be consistent. If $K_t$ and $T_t$ exhibit the same sign then this would be difficult to explain.

The coefficient on $K_t$ is expected, however, to be positive. Firstly, $K_t$ and $N_t$ will in part be complements as there is little displacement of labour. Some additional labour skills will be required to operate new capital. If new capital requires new skills (because of the adoption of new technology), then the complementary effect is stronger in the long-run when workers have time to acquire the new skills demanded. This line of reasoning is echoed by Hamermesh and Rees (1984). Moreover, adopting new capital may increase labour productivity, thus potentially raising the demand for labour; or prices may be lowered, thus increasing real wages and providing an impetus for expanding output which may offset the displacement or substitution effect of capital.
Layard and Nickell (1985), discredit a number of scenarios suggesting that a changing $K_t$ (i.e. adopting new technology) is a significant source of rising unemployment. This adds credibility to the a priori reasoning that the coefficient on $K_t$ should be positive. They argue, given that if human wants are satiated (or effective demand cannot increase), then increased productivity means the displacement of labour (i.e. the substitution effect of labour when acquiring $K_t$ is greater than the output effect). Layard and Nickell (1985) point out that there is no evidence of satiation. Another argument which implies that $K_t$ may be negative, is that the nature of capital is such, that when fully utilized, the generated output is insufficient to employ the whole labour supply. This, according to Layard and Nickell (1985), was argued by Malinvaud (1982). For this to have any explanatory power for Australia, the labour productivity of those employed would have to have risen significantly faster in PII, when unemployment started to rise rapidly. This has not occurred, according to Indecs (1986, p73). "Prior to the 1974 world-wide recession, the rate of growth of Australian productivity [measured as output per person] on this basis had averaged between 2.5 and 3.0 per cent per annum depending on the time period measured. Since 1974 there has been a distinctly slower trend [in] productivity growth. Over the last decade [1974-85] non-farm productivity growth averaged 1.7 per cent per annum." Moreover, according to Layard and Nickell (1985, p81) "productivity growth in the United Kingdom fell when unemployment rose". This implies that output had fallen. Briefly, I expect on strong a priori reasoning that the coefficient on $K_t$ should take on a positive sign. To be consistent, the coefficient on $T_t$ is expected to be insignificant and negative. The signs of the other variables are now discussed.

In respect to real wages and output a long controversy exists over the specification of the demand for labour function. The demand function here may be viewed as a hybrid of Classical and Neo-Keynesian theories. From a Classical perspective only real wages would enter the function, while only output would be explicit from a Neo-Keynesian perspective. Within a disequilibrium framework both the real wage and output should enter the labour demand function. The relative speed of adjustment toward equilibrium
may distinguish between Neo-Classical and (New)Keynesian unemployment. The output variable captures changes in product demand; output affects $N_t$ either through factor substitution or, assuming competitive conditions, the quantity of production which the firm desires to supply. An objection (from a Neo-Classical point of view) is that only the price of factors should enter the demand equation (i.e. real wages and the price of capital). If the economy is Classical in the sense that economic agents are price-takers then the objection would be valid. Firms would choose their output rate to maximize profits at a given set of prices; output itself is a function of prices and would not appear as an exogenous argument. The theme of this thesis, however, is that the economy does not in fact correspond to Classical assumptions. Thus from a dynamic disequilibrium perspective, as pointed out in theoretical sections, both real wages and the quantity of output are explicit arguments. Moreover, as Hazeldine (1979, p11) suggests, it does not appear possible to get good fits without including output as a quantity variable in the demand function.

For completeness of the discussion, the assumption behind factor substitution is cost minimisation. In dealing with factor substitution the appropriate variable to consider is the price of capital relative to the price of labour. The true price of capital, however, is difficult to determine and beyond the scope of this paper. Moreover, Hazeldine (1979, p13) again points out that "such a variable does not always work econometrically". Consequently, I proceed by specifying output and $K_t$ as quantities. The expected sign on output is positive, and negative for the real wage.

3.1.4 **The Labour Supply Function:** $N^e_t = S(W^e_t, L_t, U_t) + E_t$.

The labour force variable ($L_t$) is included as a long-run exogenous argument. The a priori sign is positive in both periods, since an increase in the number of persons aged 15 years and over increases the potential labour supply. The inclusion of real wages is based on the theory of leisure-income choice, whilst the inclusion of the $U_t$ variable is consistent with disequilibrium theory.
A positive sign on real wages would be consistent with the traditional pro-cyclical nature of the participation rate. The expected sign on $U_t$ needs careful consideration. Ham (1986) points out that underlying this type of labour supply curve (i.e. where $U_t$ is an argument) are a number of (New)Keynesian disequilibrium models, one of which is the Barro and Grossman (1971) model. If workers are off their supply curves then, as Ham (1986) discloses, $U_t$ will be a significant systematic variable. If the sign on $U_t$, for example, is negative then workers will be off their supply curves, and this will indicate involuntary unemployment. Briefly, if a significant part of $U_t$ is involuntary then a decrease in $U_t$ will constitute an increase in employment ($N_t$); if vacancies rise, the extra vacancies will be filled (i.e. engaged in employment) thus decreasing $U_t$. This of course stands in stark contrast to the Lucas and Rapping (1969) continuous equilibrium model. If $U_t$ is significant then this will indicate that workers are off their supply curves, and the Lucas and Rapping (1969) model will not be supported. If there is a positive coefficient on $U_t$, this will indicate that workers are on their supply curves, but now unemployment may be viewed as voluntary; this may have occurred in PI.

3.2 GENERAL COMMENTS

It should be pointed out that $S_t + T_t$ in a disequilibrium framework is not synonymous with the natural rate of unemployment (NRU); only in equilibrium does $S_t + T_t = NRU$. In a disequilibrium framework the variables $S_t + T_t$ may define NAIRU, where NRU may be thought of as a special or unique case of NAIRU. Constant inflation is defined as $P_t = P^*_t$, but since price expectations ($P^*_t$) are not explicit in this model there is no guarantee that NAIRU is given by $S_t + T_t$ in a disequilibrium phase.

A further point to note is that $W_t$ and $Q_t$ in the unemployment equation are not sufficient to distinguish between Neo-Classical and (New)Keynesian scenarios. A major problem is the probability of multicollinearity between these two variables, but together they explain demand-side unemployment. The relative speeds with which $N_t$ and $W_t$ adjust toward equilibrium will determine which scenario operates. "In a pure Walrasian  

---

4 This model, in particular Patinkin (1956, 1965) has been discussed in section 2.3.
world adjustment back to market-clearing equilibrium is achieved by means of [instantaneous] price adjustment. In a pure [New]Keynesian world there is no price adjustment - only quantities adjust as trading occurs at non-market-clearing prices", (Levac'ic and Rebmann, 1988, p308).

Relative speeds of adjustment are to be measured by the partial adjustment equation for employment and real wages as developed in section 2.5. The partial adjustment of each endogenous variable will take the following form:

\[ N_t - N_{t-1} = b_1(N^e_t - N_{t-1}) + b_2(W^e_t - W_{t-1}) \]  
\[ W_t - W_{t-1} = a_1(W^e_t - W_{t-1}) + a_2(N^e_t - N_{t-1}) \]

(5a)  
(5b)

The variables \( W^e_t \) and \( N^e_t \) are unobserved notional variables which can be estimated by applying Chow's (1983) estimation procedure. These notional variables can now be used to estimate, after re-arrangement, equations (5a) and (5b). The algebra is presented for (5a), but it is the same for (5b). Solving for \( N_t \) gives:

\[ N_t = b_1 N^e_t + (1-b_2)N_{t-1} + b_3 W^e_t - b_4 W_{t-1}. \]

As this point estimation may take place, but a theoretical problem exists. Firstly, \( N^e_t \) and \( W^e_t \) are simultaneously determined. Therefore \( N^e_t \) (and \( W^e_t \)) should be the dependent variable. Moreover, \( b_2 \) only gives the speed of adjustment of one disequilibrium value to another, not the speed of adjustment towards equilibrium. While the coefficient \( b_1 \) provides only the degree of disequilibrium, rearranging and solving for \( N^e_t \) (and \( W^e_t \)) will allow for simultaneous estimation and a coefficient which will give the speed of adjustment toward equilibrium. Hence,

\[ N^e_t = (-b_1^{-1})(1-b_2)N_{t-1} + (-b_1^{-1})b_3 W^e_t - (-b_1^{-1})b_4 W_{t-1} - (-b_1^{-1})N_t. \]
Regressing by using 2SLS (which in this case amounts to indirect least squares), the wage and employment equation will give estimates of:

\[-b_1^{-1}b_1, (-b_1^{-1})(1-b_2)\) and \(b_1^{-1}\), where \(b_i = \frac{(-b_1^{-1})b_i}{b_1^{-1}}\)

The estimates for both equations are:

\[
\begin{align*}
N^t_e &= b_3 W^t_e + (1-b_2)N_{t-1} - b_4 W_{t-1} + b_1^{-1} N_t \\
W^t_e &= a_3 N^t_e + (1-a_2)W_{t-1} + a_4 N_{t-1} + a_1^{-1} W_t
\end{align*}
\]

(6a) \hspace{2cm} (6b)

Subsequently, a comparison of \(b_2\) and \(a_2\) will indicate the relative speeds of adjustment toward equilibrium; speed is defined as \(\frac{\Delta N^t_e}{\Delta T} = \Delta N_{t-1}\), where \(\Delta T\) equals per unit time. If for example \(b_2 = 1\), adjustment is instantaneous; if \(b_2 = 0\) there is complete inertia. The coefficients \((1-b_2\) and \(1-a_2\)) are desirable because, as Bowden (1978) points out, they set the limits of adjustment between 0 and 1. Otherwise instantaneous adjustment is given by \(b_1 = \infty\), in other words the value that \(b_1\) takes on is not bounded. I now turn to the estimation of \(N^t_e\) and \(W^t_e\).
CHAPTER 4

THE RESULTS

4.1 THE REDUCED-FORM EQUATIONS

Estimates of reduced equations of the form \( Y_t = Z_1X_t + Z_2Y_{t-1} + \epsilon \) are presented below for both periods.\(^1\) Estimating the reduced-form equations, using quarterly data, is the first step in generating \( Y^c_t \). The results of applying OLS to the reduced-form equations are presented on the following page.

The Chow (1983) procedure dictates the specification of the above equations. Insignificant variables therefore may not be eliminated from the equations. There is also difficulty in assessing the explanatory variables on a priori economic grounds. It may, however, be pointed out that the a priori signs on the lagged variables are correct except for the variables \( N_{t-1} \) (in equation IIW) and \( W_{t-1} \) (in equation IN). Statistically 11 of the 24 explanatory variables (excluding the constant) are statistically significant (while \( K_t \) and \( Q_t \) in equation IIN are easily significant at a lesser level of confidence), and the \( \bar{R}^2 \), \( F \) and the Durban-Watson (D.W) statistics are all satisfactory. Only equation Ir that was corrected for auto-correlation, using the Cochrane-Orcutt method, is equation IN.

According to many econometricians, e.g. Thompson (1985), lagged dependent variables render the D.W. test invalid (i.e. D.W. is biased towards 2.) On the other hand, according to Koutsoyiannis (1977, p309) this has "alarmed econometricians unduly", as the alternative h-test is not without its limitations. The test is inappropriate if \( \text{nv(bi)} \geq 1.2 \). According to Koutsoyiannis (1981), Malinvaud (1966) found that the bias

\[ Z_1 = (I-M) \]

\[ Z_2 = (-BA^{-1}M) \]

\[ \epsilon = MA^{-1}E \]

\[ h = \left(1 - \frac{D.W}{2}\right) \sqrt{n/1 - \text{nv(bi)}} \]

\[ D.W = \text{Durbin Watson statistic} \]

\[ n = \text{sample size} \]

\(^1\) Where \( Z_1 = (I-M) \)

\( X_t = \begin{pmatrix} 1 \\ K_t \\ L_t \\ U_t \\ Q_t \end{pmatrix} \) and \( Y_{t-1} = \begin{pmatrix} N_{t-1} \\ W_{t-1} \end{pmatrix} \)
# REDUCED-FORM EQUATIONS

### Period I (1964(1) - 1972(2))

<table>
<thead>
<tr>
<th></th>
<th>C</th>
<th>K</th>
<th>L</th>
<th>U</th>
<th>Q</th>
<th>N_{t-1}</th>
<th>W_{t-1}</th>
<th>DW</th>
<th>R^2</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>-14.03</td>
<td>-0.0009</td>
<td>0.53</td>
<td>0.60</td>
<td>-0.0014</td>
<td>0.025</td>
<td>0.64</td>
<td>1.56</td>
<td>0.87</td>
<td>34.85</td>
</tr>
<tr>
<td></td>
<td>(1641.16)</td>
<td>(0.006)</td>
<td>(0.38)**</td>
<td>(0.29)*</td>
<td>(0.003)</td>
<td>(0.18)</td>
<td>(1.68)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>W</td>
<td>400.09</td>
<td>0.0023</td>
<td>-0.076</td>
<td>-0.076</td>
<td>-0.006</td>
<td>-0.018</td>
<td>0.40</td>
<td>2.05</td>
<td>0.98</td>
<td>276.19</td>
</tr>
<tr>
<td></td>
<td>(138.67)**</td>
<td>(0.0006)**</td>
<td>(0.03)**</td>
<td>(0.037)**</td>
<td>(0.0004)**</td>
<td>(0.019)</td>
<td>(0.15)**</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Period II (1972(4) - 1986(2))

<table>
<thead>
<tr>
<th></th>
<th>C</th>
<th>K</th>
<th>L</th>
<th>U</th>
<th>Q</th>
<th>N_{t-1}</th>
<th>W_{t-1}</th>
<th>DW</th>
<th>R^2</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>-187.80</td>
<td>-0.004</td>
<td>0.22</td>
<td>0.015</td>
<td>0.006</td>
<td>0.90</td>
<td>-2.66</td>
<td>1.90</td>
<td>0.92</td>
<td>98.41</td>
</tr>
<tr>
<td></td>
<td>(679.94)**</td>
<td>(0.003)</td>
<td>(0.164)**</td>
<td>(0.195)</td>
<td>(0.005)</td>
<td>(0.14)**</td>
<td>(1.11)**</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>W</td>
<td>-9.30</td>
<td>0.00003</td>
<td>-0.0003</td>
<td>0.0018</td>
<td>-0.00013</td>
<td>0.012</td>
<td>0.77</td>
<td>1.60</td>
<td>0.93</td>
<td>114.77</td>
</tr>
<tr>
<td></td>
<td>(59.60)**</td>
<td>(0.0003)</td>
<td>(0.014)**</td>
<td>(0.017)</td>
<td>(0.0004)**</td>
<td>(0.012)</td>
<td>(0.098)**</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1 = 1% level of significance  
α = 2.5% level of significance  
* = 5% level of significance  
** = 10% level of significance  
CO = corrected for auto-correlation using the Cochrane-Orcutt technique

Standard errors are presented in parenthesis
in the D.W statistic will decline if other variables apart from the lagged dependent variables are used as explanatory variables. Taylor and Wilson (1964), using an amended form of the D.W test (i.e. rejecting the null hypothesis if \( D.W < d_L \) and accepting if \( D.W > d_u \)), tested for the presence of serial correlation in O.L.S. regression with lagged dependent variables. They found that the D.W test performs well:

i) the larger the size of the sample,

ii) the larger the \( R^2 \), and

iii) the larger the absolute value of the coefficient on the lagged dependent variable.

The sample size for Period I is 35 and 55 for Period II. The lowest \( R^2 \) is 0.87 and generally, (except for equation IN) the value of the lagged dependent coefficient relative to other variables in the respective equations appear not to be too small. There appears to be little to choose between the D.W and h-tests. Consequently, on the basis of the D.W statistic, it is concluded that there is no significant serial correlation. According to Leobo (1976, p499) "a rule of thumb...[in practice]...is, if the D.W statistic is between 1.5 and 2.5 serial correlation is not significant." The D.W statistics of all equations are within this range; the D.W for equations IW and IIN are 2.05 and 1.90 respectively, which are not significantly different from 2. It is perhaps surprising that only one equation warranted correction for serial correlation. Thompson (1985) explains that, if the presence of serial correlation initially exists in the data, then the introduction of a lagged dependent variable will remove it.

Briefly, the four equations are quite acceptable. Experimenting with log-linear form and various lags did not, in an overall sense, improve the equations presented. In Period I, lagging \( N_t \) and \( W_t \) (both linear and log-linear) more than one period (up to 4 periods i.e. one year) resulted in a decline in the number of significant variables. Lagging \( W_t \) in equation IN more than one period rarely yielded a correct sign. When it did, however, other lagged variables exhibited incorrect signs. The scenario is similar for Period II. Lagging \( N_t \) more than one period (both linear and log linear) rarely yielded a correct sign. As in Period I when the sign was correct, there was a loss in the number
of significant variables and other lagged variables yielded incorrect signs. Consequently,
the reduced-form equations presented here are used to generate \( Y^t \) via the equation:

\[ Y^t = -BA^{-1}X_t \]

where

\[ -BA^{-1} = -BA^{-1}M(M^{-1}) \]

and \( M^{-1} \) is derived from \( (I-M)^{-1} \).

It may be noted that estimates of \( -BA^{-1} \) using the Chow (1983) procedure are
consistent. Ordinarily, however, estimates of equations (such as the reduced equations)
that follow a geometric lag of the general form,

\[ Y_t = \alpha_1 X_t + \alpha_2 Y_{t-1} + \epsilon_t \]

yield both biased and inconsistent estimates of \( \alpha_1 \) and \( \alpha_2 \). Thompson (1985) however,
points out that the presence of serial correlation alone does not lead to bias or inconsistent
estimates; a dependent variable alone leads to bias only but not inconsistency. It is the
combination of serial correlation and \( Y_{t-1} \) that results in the OLS estimator being both
biased and inconsistent. Implicit in the error term \( (\epsilon_t) \) is a geometric lag structure where
the disturbance term is auto-correlated. The estimates \( \alpha_1 \) and \( \alpha_2 \) will be biased and
inconsistent because there will be simultaneous correlation between \( \epsilon_t \) and \( Y_{t-1} \).

The partial adjustment equation (after appropriate substitution) also follows the
structure of a geometric lag, yet the estimates yielded remain consistent. This is due to
the nature of the partial adjustment equation. In essence the disturbance term is not auto-
correlated\(^4\). Hence, the application of OLS to the reduced-form equations will generate
consistent estimates, but will remain biased because of the inclusion of \( Y_{t-1} \). Bias of
estimates, however, may be less severe as the reduced equations form the basis of
calculating the unobservable equilibrium values of the real wage and employment, from
which both the model and adjustment equations can be estimated. The paper now turns
to the adjustment equations.

---

3 Refer to section 2.5

4 See the Appendix for a more detailed discussion.
4.2 **THE ADJUSTMENT EQUATIONS**

Generating observations of \( Y_{t} \) makes possible the estimation of the adjustment equations. Hopefully the equations will determine whether the economy is characterized by Neo-Classical or (New)Keynesian unemployment. Moreover, the adjustment equation with respect to employment may also shed light on labour hoarding. Consequently, adjustment equations of the form:

\[
N_{t}^{e} = (-b_{1}^{-1})(1-b_{2})N_{t-1} + (-b_{1}^{-1})b_{3}W_{t}^{e} - (-b_{1}^{-1})b_{4}W_{t-1} - (-b_{1}^{-1})N_{t} \\
W_{t}^{e} = (-a_{1}^{-1})(1-a_{2})W_{t-1} + (-a_{1}^{-1})a_{3}N_{t}^{e} - (-a_{1}^{-1})a_{4}N_{t-1} - (-a_{1}^{-1})W_{t}
\]

were estimated for both periods using 2SLS. Joint estimation is theoretically more desirable than single equation estimation. Since the model is just identified, 2SLS is equivalent to indirect least squares. Koutsoyiannis (1977, p251) suggests that the problem of multicollinearity may be bypassed if a simultaneous estimation procedure is applied. Calculation of \( a_{i}^{s} \) and \( b_{i}^{s} \) is derived as follows:

\[
b_{i} = -b_{1}^{-1}(b_{i})/b_{1}^{-1} \text{ and } a_{i} = -a_{1}^{-1}(a_{i})/a_{1}^{-1} \text{ where } i = 1, 3, 4.
\]

Thompson (1985), notes that the property of consistency carries over to the resultant \( b_{i}^{s} \) and \( a_{i}^{s} \). The estimator will have large-sample properties only; a large sample is considered to be 32 observations and greater. It is important to note that the size of \( a_{2} \) and \( b_{2} \) will show explicitly the speed of adjustment of \( W_{t} \) and \( N_{t} \) respectively toward equilibrium. Speed is defined as:

\[
N_{t}^{e} - N_{t-1}/T_{t} - T_{t-1}, \text{ where } T = \text{time.}
\]

Since \( T_{t} - T_{t-1} \) is equal to unity, the coefficients of \( b_{2} \) and \( a_{2} \) will yield directly the speed of adjustment toward equilibrium. The estimates of the adjustment equations for both periods are presented below.

**ADJUSTMENT EQUATIONS**
# ADJUSTMENT EQUATIONS

## Period I

<table>
<thead>
<tr>
<th>$N_i^e$</th>
<th>$b_1W_i^e$</th>
<th>$b_4W_{i-1}$</th>
<th>$1-b_2N_{i-1}$</th>
<th>$b_1^{-1}N_i$</th>
<th>$C$</th>
<th>DW</th>
<th>SER</th>
</tr>
</thead>
<tbody>
<tr>
<td>$(-b_1^{-1})b_i^*$</td>
<td>2.57</td>
<td>1.24</td>
<td>0.096</td>
<td>0.572</td>
<td>760.19</td>
<td>1.75</td>
<td>18.22 (1a)</td>
</tr>
</tbody>
</table>

Standard errors

| $b_i^*$ | (1.02) | (1.00) | (0.12) | (0.10) | (293.3) |

$b_2 = 0.83$

a priori sign

| + | + | + | + |

| (1%) | (15%) | (1%) | (1%) |

## Period II

<table>
<thead>
<tr>
<th>$N_i^e$</th>
<th>$b_1W_i^e$</th>
<th>$b_4W_{i-1}$</th>
<th>$1-b_2N_{i-1}$</th>
<th>$b_1^{-1}N_i$</th>
<th>$C$</th>
<th>DW</th>
<th>SER</th>
</tr>
</thead>
<tbody>
<tr>
<td>$(-b_1^{-1})b_i^*$</td>
<td>8.61</td>
<td>-0.46</td>
<td>-0.23</td>
<td>0.265</td>
<td>2617.13</td>
<td>1.98</td>
<td>54.48 (IIa)</td>
</tr>
</tbody>
</table>

Standard errors

| (2.11) | (1.29) | (0.18) | (0.18) | (279.16) |

$b_2 = 1.87$

a priori sign

| + | + | + | + |

| (1%) | (almost) | (almost) | (1%) | (1%) |

## Equations

- $C = \text{constant}$
- $DW = \text{Durban Watson statistic}$
- CO = Cochran-Orcutt corrective technique for serial correlation
- SER = Standard error of regression
- Significance levels are presented in parenthesis.
Using the Cochrane-Orcutt procedure, all equations except IIb were corrected for serial correlation. Correcting IIb for auto-correlation reduced the value of the D.W statistic; it was decided, therefore, not to correct this equation (IIb) for auto-correlation. The D.W of 1.48 just lies outside the range ±1.5 (Leabo, 1976) and the a priori signs are most satisfactory. The a priori signs are based on the reasoning that both employment and wages move pro-cyclically over the trade cycle. Based on this a priori reasoning the equations, in general, are satisfactory. Only \( W_{t-1} \) in equation IIa and IIb exhibited a more orthodox relationship. Perhaps equation IIa did not warrant correction for auto-correlation since, prior to correction, the value of the D.W statistic was 1.63; however, only the constant was statistically significant. In terms of statistical confidence, 9 out of the 20 variables are significant at the 1% level of significance, and 2 variables are significant at the 5% level. Finally, the SER appear to be satisfactorily low. On a priori and statistical grounds the equations are satisfactory. I now turn to the interpretation of the adjustment coefficients \( a_2 \) and \( b_2 \) of Chow's (1983) adjustment equations.

Chow's (1983) partial adjustment equation is easier to interpret if equation (10) from section 2.4 is recast as,

\[ Y_t = MY_{e_t} + (I-M) Y_{t-1}. \]

If \( M \) equals I then the equation collapses to \( Y_t = IY_{e_t} \), which suggests that equilibrium variables are observable, which in turn implies continuous equilibrium, and therefore instantaneous adjustment. If \( M \) equals zero there is no adjustment (i.e. complete inertia), since \( Y_t = IY_{t-1} \). The current disequilibrium variables are equal to the previous period’s disequilibrium variables. In terms of the employment adjustment equations (Ia and IIa), the range from zero to unity will measure the degree of labour hoarding. If \( b_2 = 1 \) there is no lagged response by firms, and adjustment of their stock of labour (the actual number of those employed) is instantaneous and therefore costless. If \( b_2 = 0 \) then the labour stock is not adjusted by firms to changes in the level of economic activity: there is complete inertia. Note, however, that firms may still adjust the flow of labour services (i.e. they will employ overtime during upturns and under-utilize their stock of labour during economic downturns). Finally, this paper did not constrain the coefficients \( a_2 \)
and $b_2$ to lie between zero and unity. It was decided to estimate unconstrained values of $a_2$ and $b_2$.

The coefficient $a_2 = 1.32$ suggests that in Period I wages did adjust toward equilibrium within one time period; the speed of adjustment is instantaneous. The coefficient $b_2 = .83$ in Period I suggests a speed of adjustment which is less than instantaneous. In Period II the reverse occurred, that is, wages (based on the value of $a_2 = -0.04$) did not adjust at all towards equilibrium, while labour adjusted instantaneously towards equilibrium ($b_2 = 1.87$). The value of $b_2$ in Period II appears to be too high since it suggests that the adjustment of labour by firms is costless. A summary table is presented below:

Table 4.1

<table>
<thead>
<tr>
<th>Adjustment Coefficients</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td><strong>Period I</strong></td>
</tr>
<tr>
<td>$a_2$ = 1.32</td>
</tr>
<tr>
<td>$b_2$ = .83 (.54)</td>
</tr>
<tr>
<td>NC $b_2 &lt; a_2$</td>
</tr>
<tr>
<td><strong>Period II</strong></td>
</tr>
<tr>
<td>$a_2$ = -0.04</td>
</tr>
<tr>
<td>$b_2$ = 1.87</td>
</tr>
<tr>
<td>NK $b_2 &gt; a_2$</td>
</tr>
</tbody>
</table>

On the surface it appears that a Neo-Classical (NC) scenario was operative in Period I, since wages adjust faster toward equilibrium than employment ($b_2 < a_2$), and a (New)Keynesian (NK) scenario is operative in Period II, because employment adjusts faster toward equilibrium than wages ($b_2 > a_2$). If this assessment is correct, then real wages will enter the structural equations of the model as a significant explanation of employment and unemployment in Period I, while in Period II output may enter the model as the most important variable. Analysis of the model is left to the next section.

The size of $a_2$ in Period II appears to suggest that the labour market has little to do with determining the actual level of wages, since $W_t$ does not adjust toward $W^e_t$. It is
expected, therefore, that the model that follows will indicate other factors, rather than the equilibrium wage, that will determine the actual real wage. In Period I, where \(a_2 = 1.32\), the implication is that the labour market (and hence \(W^e_t\)) plays a significant role in explaining actual real wages. One may expect \(W^e_t\) to be significant in the wage equation for Period I. As a consequence, the structural equations of the model should also supply evidence of voluntary unemployment. Moreover, since \(a_2\) in Period I implies instantaneous adjustment, then the actual wage should equal, approximately, the equilibrium wage. Indeed, a value for \(W^e_t\) of $202.86 is approximately equal to the average value for \(W_t\) of $194.95.

Comparison of \(b_2\) across both periods offers some interesting interpretations concerning firms' behaviour in respect to the adjustment of their labour stock. Clearly, in Period II labour stock has become more sensitive to changes in economic activity (output). There is evidence of labour dis-hoarding, which further indicates that businesses in Period II have become less optimistic concerning recovery after an economic downturn. The change in the behaviour of firms across the two periods, with respect to labour dis-hoarding in Period II, is consistent with Mangan (1981). Consequently, it is expected that variations in output will explain less of the variation in employment and unemployment in Period I than in Period II. A value of .83 for \(b_2\) in Period I, which is less than unity, implies some degree of labour hoarding, but is too high to conclude significant levels of labour hoarding. An alternative value of 0.54 for \(b_2\) in Period I does suggest significant degrees of labour hoarding. This alternative value was calculated from equation Ia before it was corrected for autocorrelation.

Measuring employment (\(N_t\)) as man-hours instead of the number employed, (from which relative speeds of labour hours employed and real wages may be determined), may have yielded different results, but data constraints meant that stock measures were used to capture the demand for labour. It is not altogether unfortunate, however, as it has highlighted a change in business behaviour. Essentially, businesses in Period II, have adjusted their stock of labour more readily to variations in output than in Period I.
Finally, brief mention should be made of the model's stability. A definition of dynamic stability is provided by Kmenta (1971, p592-3), where "in general...a system is stable if, in a situation where the values of the exogeneous variables are held constant through time, the mean values of the endogenous variables(s) settle down to some constant level...The system is considered unstable if, for constant values of the exogenous variables, the mean values of the endogenous variables either explode or display a regular oscillatory movement". Diagram 4.1 illustrates both a stable and an unstable model.

Part (a) illustrates a stable cobweb model. The dampened oscillatory pattern of the endogenous variables over time for a stable cobweb are depicted in parts (ai) and (aii). An unstable model, where the endogenous variables oscillate in a constant or explosive manner, is depicted in parts (b) and (c) respectively. Part (d) illustrates a stable model where exogenous variables are not constant. That is, either supply and demand curves in the cobweb model shift over time, thus changing the equilibrium position through time from $e_1$ to $e_2$ to $e_3$. Notice that equilibrium positions may change before actual values equal equilibrium values, so that I assume disequilibrium to be the rule, rather than the exception. A positive sign on $W^e_t$ in the wage equations is consistent with a stable model where equilibrium positions change, since $W_t$ will follow $W^e_t$.

Following Rao (1983), eigenvalues are computed as a test for stability. According to Chow (1983, p147) when eigenvalues are less than unity in absolute values a model is said to be stable. The eigenvalues calculated from the adjustment equations for Period I are 0.267 and 0.191, and for Period II 0.427 and 0.067, which are all less than one.

---

Diagram 4.1

DYNAMIC ADJUSTMENT TOWARD EQUILIBRIUM VALUES

Dampened Oscillations Over Time:
Stable Cobweb

Constant (regular) Oscillations

Explosive Oscillations Over Time:
An Unstable Cobweb

Stable Cobweb (Dampened Oscillations) and a Moving Equilibrium

4.3 THE STRUCTURAL EQUATIONS: A DISCUSSION

The regression results for both periods are presented below. The 2SLS procedure was used to minimize simultaneous bias and, except for equation (IIV), the correction for serial correlation using the Cochrane-Orcutt technique was warranted. Again the S.E.R. are satisfactorily low.

Period II

It was demonstrated in the previous section that in Period II businesses more readily adjusted their labour stock to variations in output (Q_t). Therefore, output (Q_t) is expected to be significant relative to real wages. Also the a priori expectation (based on the previous section) is that the labour market (i.e. W^e_t) does not determine actual real wages (W_t).

Inspection of Q_t in equations IIV and IID supports our a priori expectations. Clearly Q_t is not only highly significant but also exhibits the correct a priori signs. W^e_t is also insignificant. Real wages (W_t) do not exhibit the signs dictated by traditional economics. Indeed, they are the opposite of what orthodox economics predicts. They are consistent, however, with the pro-cyclical nature of real wages. This in turn is also consistent with the Patinkin (1956, 1965) analysis, where a positive relationship between employment and real wages is possible: if the economy is depressed, then upon stimulation the real wage will move directly with economic activity, with a rise in both output and employment (see Section 2.3).

Due to dis-hoarding in Period II, and since real wages are positively correlated with Q_t, N_t will vary more closely with Q_t. Moreover, the pro-cyclical nature of real wages is further reinforced by the signs on P_t (positive) and U_t (negative) in equation IIW (refer to section 3.1.2). Consequently, a positive coefficient on the real wage in the labour demand function, and a negative coefficient on the real wage in the unemployment equation, are consistent with the theory presented. The statistical insignificance of the
real wage in the unemployment function (IIU) maybe accounted for by a greater variation in \( U_t \), due to volatility in factors such as the participation rate and output.

Both the variables \( P_t \) and \( AW_t \) are statistically significant (\( AW_t \) also exhibits the a priori sign), strongly suggesting that an arbitration/union nexus, at the expense of labour market forces as implied by \( W^e_t \) being insignificant, predominantly explains the level of actual real wages (\( W_t \)) as discussed in section 3.1.2. An insignificant coefficient on \( U_t \) in IIW implies that union activity in terms of \( W_t \) may be active and independent of \( U_t \). This is further borne out by the fact that \( W^e_t \) is insignificant, which is consistent with the coefficient \( a_2 (= -0.04) \) for Period II as discussed in the previous section. Moreover, the positive sign on \( W^e_t \) is consistent with the eigenvalues of 0.427 and 0.067, but the fact that \( W^e_t \) is insignificant and thus explains little variation in \( W_t \) implies that the behaviour of the model, although stable, is perhaps approaching constant oscillations as depicted by diagram 4.1(b). That is, the less the market responds to the difference in supply and demand, the less equilibrium values (\( W^e_t \)) have to do with explaining variations in actual values (\( W_t \)).

At this stage is it worth noting that, on the surface, \( N_t \) is a major source of adjustment. This indicates a (New)Keynesian scenario, which also was implied in the previous section. This is further reinforced by the negative sign on the statistically significant variable, \( U_t \), in the labour supply equations. Ham (1986) argues that this indicates involuntary unemployment (refer to Section 3.1.4).

Further investigation of the model, however, indicates the presence of Neo-Classical unemployment. The positive sign on variable \( B_t \) in the wage equation suggests that a reservation wage mechanism may be present (refer to section 3.1.2). This, coupled with the negative coefficient on \( S_t \) in equation (IIU), suggests a rise in voluntary or search unemployment. Its magnitude, however, suggests that Neo-Classical unemployment is of little importance. The construction of the variable \( S_t = B_t/W_t \), however, may be inadequate as \( B_t \) only captures unemployment benefits for single adult males (without dependants). \( B_t \) does not capture all the monetary and non-monetary
## RESULTS

### Period II

<table>
<thead>
<tr>
<th>(IIU)</th>
<th>C</th>
<th>( W_t )</th>
<th>( Q_t )</th>
<th>( S_t )</th>
<th>( T_t )</th>
<th>DW</th>
<th>SER</th>
</tr>
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<tbody>
<tr>
<td>Unemployment equation ((U_t))</td>
<td>1722.65</td>
<td>-1.58</td>
<td>-0.013</td>
<td>-980.06</td>
<td>-10.76</td>
<td>1.80</td>
<td>49.11</td>
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<tr>
<td>(566.51)</td>
<td>(1.71)</td>
<td>(0.002)</td>
<td>(674.08)</td>
<td>(10.76)</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>1%</td>
<td>1%</td>
<td>10%</td>
<td>15%</td>
<td>(C0)</td>
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</table>

<table>
<thead>
<tr>
<th>(IIW)</th>
<th>C</th>
<th>( AW_t )</th>
<th>( W_t^e )</th>
<th>( P_t )</th>
<th>( U_t )</th>
<th>( B_t )</th>
<th>DW</th>
<th>SER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Real Wage equation ((W_t))</td>
<td>105.52</td>
<td>0.71</td>
<td>0.02</td>
<td>0.35</td>
<td>-0.0008</td>
<td>0.28</td>
<td>1.94</td>
<td>3.28</td>
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<tr>
<td>(63.86)</td>
<td>(0.13)</td>
<td>(0.28)</td>
<td>(0.16)</td>
<td>(0.02)</td>
<td>(0.19)</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Almost</td>
<td>5%</td>
<td>1%</td>
<td>2.5%</td>
<td>10%</td>
<td>(C0)</td>
<td></td>
<td></td>
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</tbody>
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<table>
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<tr>
<th>(IID)</th>
<th>C</th>
<th>( W_t^e )</th>
<th>( Q_t )</th>
<th>( K_t )</th>
<th>DW</th>
<th>SER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Labour demand equation ((N_t^d))</td>
<td>105.09</td>
<td>19.57</td>
<td>0.013</td>
<td>-0.004</td>
<td>1.64</td>
<td>8.05</td>
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<tr>
<td>(167.89)</td>
<td>(1.20)</td>
<td>(0.0013)</td>
<td>(0.0003)</td>
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<tr>
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<td>1%</td>
<td>1%</td>
<td>1%</td>
<td>(C0)</td>
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<th>(IIS)</th>
<th>C</th>
<th>( W_t^e )</th>
<th>( L_t )</th>
<th>( U_t )</th>
<th>DW</th>
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<tbody>
<tr>
<td>Labour supply equation ((N_t^s))</td>
<td>928.83</td>
<td>28.92</td>
<td>-0.26</td>
<td>-0.24</td>
<td>2.00</td>
<td>3.03</td>
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<tr>
<td>(122.70)</td>
<td>(0.20)</td>
<td>(0.012)</td>
<td>(0.01)</td>
<td></td>
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<tr>
<td>1%</td>
<td>1%</td>
<td>1%</td>
<td>1%</td>
<td>(C0)</td>
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</tbody>
</table>

Standard errors are presented in parenthesis.

SER = Standard Error of Regression.
D.W. = Durbin-Watson Statistic.
CO = Cochrane-Orcutt Procedure.
C = Constant.
Level of statistical significance are indicated below the respective variables.
## RESULTS

### Period I

<table>
<thead>
<tr>
<th>(IU)</th>
<th>C</th>
<th>W_t</th>
<th>Q_t</th>
<th>S_t</th>
<th>T_t</th>
<th>DW</th>
<th>SER</th>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Unemployment equation ((U_t))</td>
<td>-157.97</td>
<td>1.30</td>
<td>-0.003</td>
<td>439.81</td>
<td>-6.67</td>
<td>1.73</td>
<td>14.48</td>
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<tr>
<td></td>
<td>(48.12)</td>
<td>(0.3)</td>
<td>(0.002)</td>
<td>(164.75)</td>
<td>(5.32)</td>
<td></td>
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<tr>
<td></td>
<td>1%</td>
<td>1%</td>
<td>5%</td>
<td>1%</td>
<td>Almost 10%</td>
<td>(C0)</td>
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### (IW) Real Wage equation

<table>
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<tr>
<th>(IW)</th>
<th>C</th>
<th>AW_t</th>
<th>W^*_t</th>
<th>P_t</th>
<th>U_t</th>
<th>B_t</th>
<th>DW</th>
<th>SER</th>
</tr>
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<tbody>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Real Wage equation ((W_t))</td>
<td>-27.36</td>
<td>0.23</td>
<td>0.63</td>
<td>-0.54</td>
<td>0.017</td>
<td>-0.23</td>
<td>1.89</td>
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<tr>
<td></td>
<td>(11.88)</td>
<td>(0.06)</td>
<td>(0.15)</td>
<td>(0.98)</td>
<td>(0.06)</td>
<td>(0.14)</td>
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</tr>
<tr>
<td></td>
<td>2.5%</td>
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<td>1%</td>
<td>10%</td>
<td></td>
<td>(C0)</td>
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<td></td>
</tr>
</tbody>
</table>

### (ID) Labour demand equation

<table>
<thead>
<tr>
<th>(ID)</th>
<th>C</th>
<th>W^*_t</th>
<th>Q_t</th>
<th>K_t</th>
<th>DW</th>
<th>SER</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Labour demand equation ((N^*_t))</td>
<td>2504.27</td>
<td>-3.40</td>
<td>-0.005</td>
<td>0.014</td>
<td>1.93</td>
<td>0.68</td>
</tr>
<tr>
<td></td>
<td>(2.33)</td>
<td>(0.05)</td>
<td>(.00007)</td>
<td>(.00004)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1%</td>
<td>1%</td>
<td>1%</td>
<td>1%</td>
<td>(C0)</td>
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</table>

### (IS) Labour supply equation

<table>
<thead>
<tr>
<th>(IS)</th>
<th>C</th>
<th>W^*_t</th>
<th>L_t</th>
<th>U_t</th>
<th>DW</th>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Labour supply equation ((N^*_t))</td>
<td>230.50</td>
<td>0.52</td>
<td>0.49</td>
<td>0.66</td>
<td>2.01</td>
<td>2.10</td>
</tr>
<tr>
<td></td>
<td>(21.55)</td>
<td>(0.12)</td>
<td>(0.005)</td>
<td>(0.03)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1%</td>
<td>1%</td>
<td>1%</td>
<td>1%</td>
<td>(C0)</td>
<td></td>
</tr>
</tbody>
</table>
benefits of being unemployed such as medical, transport and housing concessions which are especially important for families, nor the pleasure derived from not working, or a reduction in the work ethic. Essentially, Neo-Classical aspects are present in the model, since social and economic institutions (as indicated by the prominence of $AW_t$ and $P_t$ at the expense of $W^c_t$) appear to have generated a real wage overhang. The estimate of $W^c_t$, (equal to $230.43$ on average), is below $W_t$ ($262.78$), which is a real wage overhang.

The model is performing well, as it has generated a real wage overhang which is characteristic of Period II (Indecs, 1986). In the model, however, the real wage overhang can be explained equally well by a decline in $Q_t$ or an arbitration/union nexus. For example, as briefly explained in Section 3.1.2, award wage decisions, probably resulting from union pressure, may maintain real wages above the market clearing level. This scenario, as pictured here, is consistent with Patinkin's (1956, 1965) analysis and is described by Barro and Grossman (1971) as Neo-Classical Involuntary unemployment. Stimulating output will not reduce unemployment unless the real wage is reduced, but a reduction in real wages may not in itself be sufficient to expand output and hence employment (i.e. decrease unemployment). This is consistent with the analysis in Section 2.3, which supports the proposition that, as $W_t$ approaches $W^c_t$, unemployment may remain unchanged or only decline slightly, i.e. non-clearing market equilibrium.

According to Trivedi and Baker (1982), evidence suggests the emergence of Neo-Classical unemployment. However, they found, by further manipulation of their model, that after 1972, firms were constrained by orders for their goods. It appears, therefore, that firms are quantity-constrained, which implies demand-deficiency. Clearly this can be described as Neo-Classical involuntary unemployment. It appears, therefore, that both real wages and quantity constraints, both of which are demand factors, explain variations in $U_t$ for Period II.

This last proposition is supported by the fact that both the non-demand factors ($S_t$ and $T_t$ in equation IIU) are insignificant. The sign on the Stoikov Index ($T_t$) supports the hypothesis that structural unemployment explains little variation of a rising $U_t$ in Period II. Trivedi and Baker (1985) also found that the Stoikov index was not important in
explaining $U_t$. Supporting this is Mitchell's (1983) survey of the Australian labour market, which found no evidence that change in the composition of the labour force or social changes are the root of the level of increased unemployment since the early 1970s (King, 1986, p102). King (1986, p102) however, states that while Mitchell did not provide a detailed refutation, "Mitchell was correct with respect to the current unemployment, which is overwhelmingly demand-deficient in nature, and [...] past experience suggests little reason to fear a substantial rise in structural unemployment in any future vigorous upswing".

An unexpected result, however, is the variable $K_t$ in equation IID. It is significant and yielded a negative sign. While it was expected to be significant, the sign runs counter to the above conclusions and the body of theory presented in section 3.1.3. If output ($Q_t$) is pressing against productive capacity, it is reasonable to assume that firms may expand their capital stock ($K_t$). The implication of a negative sign on $K_t$ in the employment function is:

(i) that the displacement of labour would contribute to structural unemployment, therefore $T_t$ in the unemployment equation should be significant and positive; and
(ii) labour productivity should increase because the capital-labour ratio would be rising. Increasing capital stock relative to the quantity of labour employed, assuming that output either increases or remains constant, should increase output per worker.

The variable used to capture structural unemployment ($T_t$) in Period II, however, is statistically insignificant and yields a negative sign. The two variables enter the model with the same sign and are therefore inconsistent. Moreover, as indicated by Indecs (1986), Australia has witnessed declining growth rates of average productivity of labour during Period II. These conflicts need explanation, which is attempted below.

One explanation is that the conflicting signs on $K_t$ and $T_t$ may have arisen because the structural unemployment variable ($T_t$) is inadequate in capturing shifts in labour skills demanded and supplied. Perhaps other measures of structural unemployment should be tried. Alternatively, evidence of a real wage overhang in Period II is consistent with a
negative $K_t$, in equation IID. That is, firms which are output-constrained, but face excessive real wages may, in the long run, be induced to increase their capital stock in an attempt to reduce production costs. A rising capital-labour ratio, if associated with sluggish growth in $Q_t$, may reflect declining growth in labour productivity.

Furthermore, if we accept that the variable $K_t$ is capturing labour substitution, the conflict between the signs on $K_t$ and $T_t$ may be resolved when one acknowledges that, because output is deficient in Period II, it has not offset the rise in unemployment due to labour displacement. If the displaced labour remains unemployed because of poor growth in output, we may still conclude that unemployment is the result of insufficient output. The substitution effect of labour for capital is greater than the output effect.

It is difficult, however, faced with a negative coefficient on $K_t$ to accept that the displaced labour does not show up as being structurally unemployed, although, if they reject jobs that do not require their skills, then the displaced workers may be viewed as becoming involuntary unemployed. The model indicates that $Q_t$ is significant in explaining both employment and unemployment in a period that experienced rising unemployment (graph 1.1, section 1.1.1). Adopting $K_t$ which displaces labour when output ($Q_t$) is constrained, is consistent with labour dis-hoarding. In contrast, if output is expanding when firms are adopting labour-saving capital, then labour productivity should rise without contributing to unemployment. Levacic and Rebmann (1988, p70), make the point that "the acquisition of labour-saving capital equipment will reduce firms' demand for specific types of labour and for labour in general unless demand growth keeps pace with the increase in labour productivity."

Assuming, however, that output is not constrained, the real wage overhang (and labour dis-hoarding) still flies in the face of declining growth rates of average productivity of labour during Period II (Index, 1986); too high a real wage will lead to increased $K_t$ and retrenchment of the least efficient labour, which raises productivity. However:
productivity is difficult to measure; in particular, averages may hide rapid productivity growth in many industries (of different sizes). An unweighted average smooths out differences across industries;

there may be disguised productivity increases. The nature of some changing capital is not as readily measurable as physical output, and

in practice firms retrench labour based on other principles, such as marital status or the "last-on-first-off" principle.

At this stage we are unable fully to explain these results. The assumption of unconstrained output, however, does not appear to be plausible for Period II. Rather, evidence of firms facing output constraints, in Period II, has been presented earlier in this section and section 2.3.1.

Finally, \( w^e_t \) in IIS confirms the established behaviour of the participation rate. It would appear that the behaviour of the participation rate in the mid 1970s, as described by Gregory and Duncan (1979 (in Gregory, 1984)) was atypical. The negative sign on \( L_t \) in Period II is unusual and up to now remains unexplained. In Period I, however, \( L_t \) in equation IS indicates appropriately the positive relationship between \( L_t \) and \( N^e_t \). Moreover, \( w^e_t \) in IS exhibits the same leisure-income trade-offs as in Period II. We now turn to Period I in more detail.

**Period I**

As in Period II there is no evidence of structural unemployment. Variables \( K_t \) and \( T_t \) enter the model with opposite signs suggesting little labour substitution. The coefficient on \( K_t \) is positive which is consistent with the proposition that capital is labour-augmenting. The coefficient on the variable \( T_t \) is insignificant and negative, which indicates that structural unemployment does not explain \( U_t \) in Period I. The variable \( S_t \) is highly significant and the positive sign indicates a high degree of voluntary unemployment (Section 3.1.1). This is reinforced by the significant positive sign on \( U_t \) in equation IS, which again indicates voluntary unemployment (Ham 1986). If unemployment in Period I is primarily voluntary, one would expect actual wages (\( W_t \)) to
be either below or equal to equilibrium wages \((W^e_t)\). Indeed, on average, actual wages (= $194.95) were estimated by the model to be just below equilibrium wages ($202.86). In essence, if unemployment in Period I is voluntary then wages should be the primary source of adjustment in the labour market. This is borne out by the correct signs on the statistically significant wage variables in the relevant structural equations and the analysis in the previous section, where the value of \(a_2\) in Period I suggests instantaneous adjustment.

A theoretical scenario which explains the real wage underhang (i.e. actual wages suppressed below equilibrium wages) is Keynes' theory of inflation (cited in Trevithick and Mulvey (1976)). The theory is also satisfying in two other respects as it allows for:

i) inflation that is contained; and

ii) a rising real wage over time, even though it is suppressed below equilibrium.

These two characteristics are also consistent with the experience of the 1960s in Period I.

The Neo-Keynesian one-sector output model, which underlies the IS-curve in the IS-LM framework, implies convergence of inflation. Keynes, however, in his article 'How to Pay for the War' (cited by Trevithick and Mulvey (1976)), raises the possibility that inflation may be persistent. The distribution of income between workers and business (owners of capital) plays a crucial role. Keynes assumed a wage-price mechanism (which is akin to a wage-price spiral) where prices react instantaneously to wages, while money wages respond fully, with a lag to price rises by a constant factor (say \(\lambda\)). This is summarised in the following two equations:

\[
\begin{align*}
    P_t &= (1 + \lambda) W_t \\
    W_t &= P_{t-1}
\end{align*}
\]

Prices and wages will continue to rise at the proportional rate of \(\lambda\) in all periods except the first. Inflation will occur at a constant rate. If either labour or businesses try to gain greater amounts than \(\lambda\), then inflation will accelerate, which appears to have occurred in Period II as evidenced by a significant positive \(P_t\) in equation IIW. In Period I, the variable \(P_t\) is insignificant, and thus does not explain variations in \(W_t\). The difference in the significance of \(P_t\) across periods suggests a lagged response to money wages that
have at least instantly adjusted or even over-adjusted to a rise in current prices. Consequently, the variable $P_t$ in Period I is consistent with Keynes' theory of inflation. In Period II there appears to be no lag between money wages and $P_t$; the evidence of a real wage overhang for this period is consistent with greater claims on $\lambda$. To test the credibility of the lagged scenario it was decided to lag prices in the wage equation for Period I. The results are presented below:

<table>
<thead>
<tr>
<th>IW(a)</th>
<th>C</th>
<th>$AW_t$</th>
<th>$W^e_t$</th>
<th>$P_{t-6}$</th>
<th>$U_t$</th>
<th>DW</th>
<th>SER</th>
</tr>
</thead>
<tbody>
<tr>
<td>$W_t$</td>
<td>-57.65</td>
<td>0.21</td>
<td>0.12</td>
<td>3.85</td>
<td>0.001</td>
<td>1.93</td>
<td>1.66</td>
</tr>
<tr>
<td></td>
<td>(23.40)</td>
<td>(0.04)</td>
<td>(0.14)</td>
<td>(1.44)</td>
<td>(0.02)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$2.5%$</td>
<td>1$%$</td>
<td>1$%$</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Clearly $P_t$ becomes highly significant when lagged six periods. This adds credibility to the lagged scenario presented by Keynes (as set out by Trevithick and Mulvey (1976)). Equation IIW indicates that a lag does not operate in Period II. To confirm this, prices were lagged up to six periods; predictably the coefficient was not significant.

Note that $B_t$ in IWa was omitted because the negative sign on $B_t$ in (IW) indicates that causation between $W_t$ and $B_t$ does not flow in the direction that is implied by specifying $B_t$ on the right hand side of the equation (see section 3.1.2). The unemployment variable is insignificant in both equations (IW, IW(a)), as was the case in IIW. The variable was equally insignificant in both equations, but $W^e_t$ became insignificant in IW(a). This is not too disappointing, as it was argued that arbitration in Period I may have imposed a lag in labour market adjustment.

---

7 The equation warranted correction for auto-correlation, using the Cochrane-Orcutt (CO) technique. Standard errors are presented in parentheses and the respective levels of statistical significance are presented below each respective variable. The standard error of regression is satisfactorily low.
In summary, equation IW(a) supports the suggestion of a lagged response of money wages to current prices. Perhaps in Period I, unlike Period II, unions were preoccupied with working conditions and prices were considered less significant. Perhaps workers suffered from money illusion, but according to Neo-Keynesians this assumption would cause inflation to decline. Inflation was persistent and fairly constant, which is what Keynes' scenario predicts. The scenario explains the real wage underhang which also allows for real wages to rise over time.

How would one describe or characterize the economy during Period I? The adjustment equation suggests that the economy conforms to Neo-Classical theory, since real wages are the major source of adjustment. Indeed, real wages are more significant in the unemployment equation (IU) in explaining unemployment than is output. The relationship, unlike that in Period II, exhibits the traditional (Neo-Classical) relationship between $U_t$ and $W_t$. The inverse relationship between employment and real wages is confirmed by the coefficient on $W^e_t$ in equation ID. The economy during Period I conforms to Neo-Classical theory, in that real wages changes were sufficient to stimulate sufficient output to provide full employment.

A disequilibrium regime, not expected to occur until this point, but which is found in the literature of disequilibrium, is 'Repressed Inflation'. This regime is characterised not only by a real wage underhang (excess demand for labour in the labour market), but also by excess demand in the product market: both goods and labour market are characterised by excess demand. Clearly, this describes Period I. There is evidence of a real wage underhang; sufficient or high output levels (excess product demand), and hence at least full employment and finally, constant but contained inflation rates (i.e. repressed due to a real wage underhang). Product market equations would need to be added to the existing model to determine this. This thesis, however, tentatively concludes that Period I can be best described as a 'Repressed Inflation' regime.

Excess demand in the product market certainly explains why output is highly significant (although less significant than real wages) in equation IU. A (New)Keynesian, however, would question why there is excess demand for output
when real wages are low, since real wages constitute a significant proportion of aggregate (effective) product demand. In Period I the high levels of output may be explained by reference to fiscal policy.

Probably, fiscal policy was more effective in Period I than in Period II, because of the following factors:

i) A real wage underhang. In Period II it was demonstrated that a real wage overhang thwarted economic expansion, and labour costs rose.

ii) Smaller leakages in Period I. Perhaps in Period II the marginal propensities to import, save and tax have risen. For example, bracket creep (due to inflation) has pushed incomes into higher marginal tax brackets. Consequently, the income multiplier with respect to net government spending on goods and services is smaller.

iii) Related to (ii), given that fiscal policy is less expansionary in Period II, then shortfalls in government revenues have had to be made up by government borrowing (i.e. selling bonds to the public), thus placing pressure on the financial market to raise interest rates. The higher interest rates have dampening effects on the economy which further lower the income multipliers. Borrowing from the Reserve Bank may validate the inflationary process by increasing the growth rate of the money supply.

iv) Unlike Period I, budgets in Period II had a greater proportion of spending on transfer payments relative to government spending on goods and services. A possible indirect effect is to reduce the economy's capacity to generate taxation revenue because the budget is less effective in stimulating national income. This in turn has implications for public sector borrowing requirements to the extent that an expanding budget deficit does not generate increases in taxation revenue. If growth in national income is slow, number (iii) above, will be exacerbated.

To the extent that excess aggregate product demand in Period I is the result of effective fiscal management, and Keynes' theory of inflation is consistent with the
disequilibrium regime of 'repressed inflation', then clearly this regime also has elements of Keynesianism. The 'repressed inflation' regime, as in Period I, is a mix of (New)Keynesian and Neo-Classical scenarios. It is Neo-Classical to the extent that the real wage underhang facilitates full or over-full employment. The adjustment equations indicate that real wages were the major source of adjustment, and equations ID and IU show an inverse relationship between real wages and employment.

A difficult result to explain, however, is the significant but negative relationship between $Q_t$ and employment in the labour demand function (ID). It is inconsistent with the apparently correct sign on $Q_t$ in equation IU and it is difficult to decide which is correct. The negative relationship between $Q_t$ and $U_t$ implies, a priori, a positive relationship between employment and output. If Period I is characterized by significant degrees of labour hoarding it is conceivable that over the business cycle a negative relationship between employment and output may result. Perhaps a negative $Q_t$ in ID is not, as first thought, odd. Moreover, the coefficient on $Q_t$ in IU is only just significant at the 5% level of confidence; the coefficient on $Q_t$ (in IU) is not far from being positive, but the inconsistent signs on $Q_t$ in equations IU and ID are difficult to fathom.

4.4 SUMMARY: AN OVERVIEW

Disequilibrium economics is relatively new and the literature is in its infancy. Consequently, the interpretation of regression results is difficult. Results that at first glance appear to be unsatisfactory in fact suggest scenarios that were not obvious. For example:

i) the interpretation of $U_t$ in the respective labour supply equations (IS and IIS) allows us to distinguish between voluntary and involuntary employment;

ii) a positive relationship between real wages and the demand for labour (i.e. a negative relationship between $U_t$ and $W^e_t$) in Period II proved to be consistent with Patinkin's (1956, 1965) disequilibrium analysis;
iii) a negative sign on $K_t$ in the demand for labour function (IID) in Period II, it was argued, may not be inconsistent with a negative $T_t$ in the unemployment equation IIU; and finally

iv) an awkward negative sign on $Q_t$ in the demand for labour function in Period I, may well be consistent with labour hoarding in that period.

Generally, speaking, however, the variables were internally consistent, which adds credence to the model.

**TABLE 4.2**

**Summary of Conclusions**

<table>
<thead>
<tr>
<th>Period I</th>
<th>Period II</th>
</tr>
</thead>
<tbody>
<tr>
<td>- voluntary unemployment</td>
<td>- involuntary unemployment</td>
</tr>
<tr>
<td>- real wage underhang</td>
<td>- real wage overhang</td>
</tr>
<tr>
<td>- real wages major source of adjustment</td>
<td>- employment major source of adjustment</td>
</tr>
<tr>
<td>- no capital substitution</td>
<td>- capital substitution; labour displacement</td>
</tr>
<tr>
<td>- determination of real wages influenced by market conditions</td>
<td>- real wages not determined by labour market forces; essentially determined institutionally</td>
</tr>
<tr>
<td>- employment unresponsive to output variations</td>
<td>- employment more responsive to variations in output than in Period I</td>
</tr>
<tr>
<td>- repressed inflation</td>
<td>- Neo-Classical involuntary unemployment</td>
</tr>
<tr>
<td>- demand factors more significant than non-demand factors</td>
<td>- demand factors more significant than non-demand factors; although capital substitution involved in unemployment nexus over the long run</td>
</tr>
<tr>
<td>- structural unemployment insignificant</td>
<td>- structural unemployment insignificant</td>
</tr>
</tbody>
</table>
Another interesting result of the model is that the results across the two periods are almost mirror images. The table below summarizes the conclusion drawn for both periods and except for the last two conclusions they are mirror images. I found no evidence of rising structural unemployment in either of the periods, and search unemployment was found to be unimportant in Period II. In both periods demand factors appeared to be the major explanation of unemployment; where Period I is characterized by 'Repressed Inflation', Period II was described as 'Neo-Classical Involuntary Unemployment'. Neither period was characterized by either pure (New)Keynesian or pure Neo-Classical regimes. As implied by the terms 'Neo-Classical Involuntary' and 'Repressed Inflation', each period was a hybrid of (New)Keynesian and Neo-Classical scenarios. Both these descriptions are consistent with the conclusions that demand factors (i.e. a wage-output (demand) nexus) primarily explain unemployment, but are opposite in that underlying 'Repressed Inflation' is a real wage underhang while a real wage overhang underlies 'Neo-Classical Involuntary' unemployment.

4.5 POLICY IMPLICATIONS

Classifying Period II as Neo-Classical Involuntary implies that the economy in this period is suffering from a real wage overhang and insufficient output. The removal of the overhang, however, would be not sufficient to stimulate output. This conclusion is derived only from a disequilibrium framework, where the equality of the actual with the equilibrium real wage is possible, but unemployment may still exist because of insufficient output (Patinkin 1956, 1965); i.e. non-clearing market equilibrium. On the other hand an expansion in output will not lead to a sustained decline in unemployment because of the real wage overhang. The real wage overhang will persist during an expansion in output, because the model predicts that real wages move pro-cyclically.

With this in mind, a prerequisite to a sustained decline in unemployment is a reduction in real wages. To this end the current policy of the Accord is appropriate. Generally the policy of wage restraint advocated by the current Labor government is a step in the right direction.
Output, however, needs to be stimulated in order to reduce unemployment, because a decline in real wages is not a sufficient condition to reduce unemployment. At the time of writing this thesis, it is acknowledged that Australia is facing an international constraint. Allowing the exchange rate to float and consequently depreciate, however, achieves simultaneously a stimulus to output and a reduction in real wages, assuming that the accord is successful in containing money wages. Assuming that the trade deficit is not too large in the near future, and real wages are again not too excessive, then the government can supplement output expansion by providing monetary/fiscal expansion. Under these conditions government borrowing should not place excessive pressure on interest rates, as taxation revenue should rise without any necessary increase in the marginal tax rate. When real wages are too high, any monetary/fiscal expansion will thwart a sustained rise in national income and employment, and hence in taxation revenues. Importantly, however, a reduction in the real wage is not sufficient to reduce involuntary unemployment, but appears to be a necessary prerequisite.
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