<table>
<thead>
<tr>
<th><strong>Title</strong></th>
<th>What’s in store for the Celtic Tiger?</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Authors(s)</strong></td>
<td>Walsh, Brendan M.</td>
</tr>
<tr>
<td><strong>Publication date</strong></td>
<td>1999</td>
</tr>
<tr>
<td><strong>Publication information</strong></td>
<td>Irish Banking Review, (Spring 1999): 2-15</td>
</tr>
<tr>
<td><strong>Publisher</strong></td>
<td>Irish Bankers’ Federation</td>
</tr>
<tr>
<td><strong>Item record/more information</strong></td>
<td><a href="http://hdl.handle.net/10197/1585">http://hdl.handle.net/10197/1585</a></td>
</tr>
</tbody>
</table>
WHAT'S IN STORE FOR THE CELTIC TIGER?

Prof. Brendan M. Walsh, Department of Economics,
University College Dublin *

In exploring the medium-term prospects for the Irish economy, this article argues that a pessimistic scenario, in which the rapid growth of recent years inevitably ends in a crash, is not plausible. But neither is it realistic to expect a continuation of "Celtic Tiger" growth rates. Under Irish conditions, GNP growth in excess of 3.5% a year leads to falling unemployment. When "full employment" is reached, further reductions in unemployment lead to rising wage inflation. In the absence of an exchange rate adjustment, high wage inflation leads to a loss of competitiveness. This acts as a break on growth. For these reasons, the realistic medium-term prospect for the Irish economy is that the growth rate will revert to its long-run average in the region of 3.5%.

The growth of the Irish economy during the 1990s has been phenomenal, but there is no consensus about its medium-term prospects. Pessimists suggest that growth rates as high as those recently recorded will lead to a hard landing. Optimists hope that the expansion of the supply side of the economy will facilitate further rapid growth. This article explores some alternative scenarios and offers a view on the likely evolution of the economy.

THE RECORD

For the last five years the rate of growth of output has been extraordinary both by comparison with the long-run Irish record and by international standards. The phrase "Celtic Tiger" was coined to refer to this performance.

* The author would like to acknowledge helpful comments from Terry Concannon, Cathal Guimard, John Fitzgerald, Peter Jarrett, Anthony Ludlam and John Martin. Responsibility for the views expressed is, of course, the author's alone.
Table 1 displays the annual average growth rates of output, employment and output per worker over the period 1994-98. For comparative purposes growth rates for the period 1960-93 are also shown.\(^1\)

The rate of growth of GDP since 1993 has been exceptional and that of GNP only slightly less impressive. But the growth of employment has been most spectacular, averaging 4% per year over the period 1994-98. Employment growth at this pace is without parallel in the OECD countries. Indeed, the estimated 6% increase in the numbers at work between 1997 and 1998 is surely a world record.\(^2\) Because employment has been growing so rapidly, the rate of growth of output per worker has been far less spectacular than that of total output. In fact, the annual average growth rates in GNP per person at work before and after 1994 are surprisingly similar. Although the long-run rate of growth of productivity has been satisfactory, it did not increase markedly after 1994. If attention had been focused on output per worker, rather than total output, the phrase “Celtic Tiger” might never have become popular.\(^3\)

The historical decline of the Irish population and chronic high rates of unemployment and emigration have made job creation a national priority. The exceptional growth of employment has therefore been widely welcomed. But we should now question the

\(^1\) It is generally accepted that gross national product (GNP) is a better guide to the trend in living standards than gross domestic product (GDP). The profits of transnational companies inflate GDP, but are excluded from GNP. An even better measure of the trend in living standards is provided by gross national disposable income (GNDI) which adds current transfers from abroad to GNP, but this is less widely used. More detail on the measurement of Irish economic growth is provided in Laidin and Window, 1998, and Honohan, Maître and Comoy, 1998.

\(^2\) The recorded increase was actually 4.3% but some 2% of this is attributed to the change in methodology between the former Labour Force Survey and the new Quarterly National Household Survey.

\(^3\) Productivity may have been growing more rapidly than is implied by the official statistics. Employment in construction, hotels and restaurants, transport, distribution, and financial and business services increased by 17.7% in 1997-98. It is notoriously difficult to measure productivity in these sectors.
importance of the size of the economy, relative to improvements in average living standards, as a goal of economic policy. Recent growth rates have been more than adequate to absorb the growth of the labour force and stabilise unemployment. Women’s labour force participation rates have risen to the European average and emigration has been replaced by significant net immigration. It is timely, therefore, to ask what is to be gained from further rapid output growth in itself. We should now focus on raising the living standards of the population rather than trying to maximise the level of employment. At least it would be appropriate to modify the criteria applied in cost/benefit analysis of job creation programmes to reflect the congestion and other external costs associated with growth, as has been suggested recently (Honohan, 1998).

The focus of the rest of this paper is on the future prospects of the economy. It is argued that neither the pessimists, who predict that the current boom must inevitably end in a bust, nor the optimists, who believe that rapid growth can be prolonged more or less indefinitely, are likely to be proved right. The unsurprising conclusion is that a return to a lower growth path is more probable. An estimate of the economy’s sustainable growth rate is provided.

A PESSIMISTIC SCENARIO

Some see hubris in Ireland’s current boom and a hard landing as the inevitable consequence. They have in mind a replication of the crashes that countries like South Korea, Indonesia, Thailand and Malaysia experienced in 1997.

This would be a grim prospect. In Indonesia growth averaged almost 8% a year between 1990 and 1996, but fell to 5% in 1997 and to minus 14% in 1998. This collapse is shocking primarily because of the vast scale of the human suffering it has brought in its wake (World Bank, 1998), but the suddenness with which it occurred and the lack of warning from the international economics profession are also worrying. In October 1996 the International Monetary Fund (IMF) referred to the “buoyant growth prospects” in Asia (IMF, 1996: 28), while in October 1997 a growth rate of 7½% was forecast for 1998 (IMF, 1997:19).

Some believe a similar fate awaits the Celtic Tiger. They anticipate that a collapse in asset prices – notably residential and commercial property values – will lead to a loss of consumer and investor confidence and to a flight of capital from the country. The trigger might be a cyclical downturn in sectors such as microelectronics, pharmaceuticals, or international financial services. A severe recession would be the inevitable consequence.
It is true that the recent exceptional growth of the Irish economy has been very dependent on the growth of world trade and inflows of foreign direct investment (FDI) motivated by the use of Ireland as an export platform. Exports grew much faster than output during the 1990s. It is therefore only realistic to conclude that a contraction of world trade would have a very severe impact on Ireland. The label pessimist should be reserved for those who believe that the current Irish boom will lead to an Asian-style crash even in the absence of a global recession. The pessimistic view implies that our nemesis will be “overheating”, a retribution for the exceptional growth that has been achieved.

This scenario may be queried on several counts. In the first place there is no economic law that says “the faster they grow the harder they fall”. The evidence does not show that rapid growth, at either the national or regional level, inevitably leads to a bust.\(^4\) True, financial bubbles do recur and they are frequently not recognised until it is too late. In many Asian economies the crash was preceded by bubbles in real estate values. But the behaviour of Irish house prices – at least until end-1997 – can be accounted for by fundamental factors such as the growth of the number of households, the rise in disposable income and falling interest rates (Bacon et al., 1998). A slump in house prices is unlikely to trigger a recession in the way that the collapse in speculative real estate booms preceded the Asian crises. In those countries real estate speculation was fuelled by inflows of capital attracted by high interest rates and corrupt banking systems led to massive misallocation of resources. In Ireland FDI has been the main type of capital inflow and this is much less destabilising than portfolio investment (IMF, 1998).

The collapse of the residential property market in England in the early 1990s was caused by a unique combination of factors. These included the removal and re-imposition of domestic rates and major changes in the tax treatment of mortgage interest. It is true that the recent convergence of Irish interest rates on euro-zone rates is an unwelcome pro-cyclical influence on house prices. The removal of the Residential Property Tax was also inappropriately pro-cyclical and has precluded the use of property taxes as a way of calming the housing market. But, despite these considerations, the parallels with the situation leading up to the English housing bust are not close.

Most of the Asian countries that crashed had pegged their currencies to the US dollar during the 1990s. This was beneficial as long it helped to control inflation without undermining competitiveness. But between mid-1995 and mid-1997 the dollar/yen exchange rate rose from 85 to 125. East Asian currencies were dragged up by the appreciating dollar and their current accounts moved into deficit. For a while these

\(^4\) For a trenchant refutation of this notion see Krugman (1998).
deficits were readily financed by capital inflows, attracted by high interest rates and the apparent absence of exchange rate risk. But as the precariousness of the situation became evident, speculators attacked the vulnerable currencies. Despite official assurances that parities would be defended, the Korean won, the Malaysian ringgit, the Indonesian rupiah and the Thai baht were all devalued in the course of 1997. When some semblance of normality returned to markets early in 1998, the Indonesian rupiah had lost three quarters of its previous value in terms of the dollar. Many other East Asian currencies also depreciated by large amounts.

On this score, too, the parallel between Ireland’s present situation and that of the Asian economies is not close. There is a sizeable surplus on the Irish current account. The Irish pound did not become sharply overvalued in its dying days. Instead, thanks to the widening of the ERM bands in 1993 we were able to avoid the real appreciation that sterling underwent as it rose from DM2.30 to over DM3.00 in 1996-97. The euro conversion rate of the Irish pound and the recent fall in the euro have placed the economy in a very competitive position. Those opposed to Ireland’s entry to Economic and Monetary Union (EMU) warn of the economy’s vulnerability in the event of a sudden sharp depreciation of sterling relative to the euro. Several sectors of the Irish economy would be adversely affected if this happened. But while foreign exchange markets will retain their capacity to surprise, the probability is small that the sterling/euro exchange rate will fluctuate as widely as the dollar/yen rate.

A final consideration relates to the sources of Ireland’s rapid growth. Although the crisis in Asia was not widely anticipated by economists, attention had been drawn to structural weaknesses (Young, 1992; Krugman 1994). It was pointed out that the spectacular growth of the “Asian Tigers” was not “miraculous” but mainly a reflection of rapid growth of capital and labour inputs. The growth of output per unit of capital and labour inputs (Total Factor Productivity (TFP)) was not spectacular. The importance of this point lies in the fact that, in the long run, improvements in living standards depend primarily on the growth in the efficiency with which inputs are used.

The Irish record on this score provides further reassurance. We have achieved a credible long-run rate of productivity growth. Recent studies estimate that TFP increased by 4% a year between 1987 and 1997 (Kenny, 1996; Nugent, 1998). This compares with a TFP growth rate of only 2% over the period 1975-90 in Singapore, for example (Sarel, 1996). It is important, however, to bear in mind that our productivity growth reflects the impact of the inflow of FDI and the decline of low productivity employment in agriculture, distribution and the public sector. The contribution of these factors to productivity growth will decline in the future.

[5] But it is true, as pointed out above, that there was no dramatic increase in this growth rate during the “Celtic Tiger” period.
In summary, while the risks of speculative bubbles and resource misallocation are not absent from the Irish economy, the situation is not very similar to that prevailing in the Asian economies before the crash of 1997. A scenario in which the Irish boom ends in a homegrown bust is not very plausible. But that does not imply that the good times will roll on forever. A global recession would lead to a hard landing, but it is more likely that the boom will run out of steam due to the operation of basic economic constraints. These are discussed below.

AN OPTIMISTIC SCENARIO

At the other end of the spectrum from those who expect the current boom to be followed by a crash are optimists who see no reason why Ireland's exceptional growth should not continue long into the future. The rosy scenario envisaged by these commentators is based on a belief that several favourable trends can be maintained. These include:

- rapid labour force growth;
- rapid productivity growth;
- wage moderation.

In addition, it is believed that existing infrastructure and housing deficits can be rapidly eliminated. However, each of these assumptions is questionable.

The supply of labour is no longer as elastic as it was in the 1990s. The rapid growth of the labour force over the past decade was due to non-repeatable factors such as the sharp rise in women's labour force participation rates and the arrival on the labour market of the baby boom of the late 1970s. Further increases in women's labour force participation rates will only be elicited by higher rates of pay to compensate for rising work-related costs – childcare and transportation, for example. The reversal of net emigration was also important, but as the supply of returning emigrants dries up, the rate of immigration will be increasingly constrained by housing shortages and by restrictive policies towards non-EU citizens. The contrast with some regions of the US, where rapid growth is facilitated by a virtually free flow of low-wage labour from Latin America and further afield, is striking. For this reason, and because of the inadequacy of our infrastructure, the parallel between the booming Irish economy and regions of the US is not as close as might appear (Krugman, 1997).

The growth of productivity will be checked by the fact that the recent “shake out” of the labour force cannot be continued. The decline of low-productivity employment will be proportionately less important in the future. Irish manufacturing has been transformed
by the inflow of high-tech FDI and additional projects will have a reduced impact on average productivity. Employment in service sectors is growing in importance and productivity gains are generally much smaller here than in manufacturing.

The prospects for continued wage moderation should be linked to the impact of rapid growth on unemployment and the labour market. This topic is discussed below.

Finally, optimism about the prospects of rapidly overcoming our infrastructure deficits is not warranted. The binding constraint is not financial. The public finances could accommodate significant increases in capital spending and there is also ample scope for public-private financial partnerships. The bottlenecks are in the planning, implementation and management of large projects, as well as in the emerging labour shortages in the construction sector. It may be decades rather than years before the existing backlogs in urban and industrial infrastructure housing and the national transport network are removed.

For these reasons, it is implausible to argue that the Irish economy can maintain the high output growth rates that have been recorded since the mid-1990s. There is no evidence of a sea change on the supply side of the economy to justify this optimism. In fact, all the evidence suggests that we are now approaching the point where the constraints on growth will become increasingly binding. We must now examine these constraints explicitly.

LIMITS TO GROWTH

A realistic assessment of the medium-term prospects for the Irish economy should eschew the pessimistic and optimistic scenarios outlined above. Instead, guidance should be found in tried and tested economic "laws". Two robust generalisations are relevant. The first is "Okun's Law" and the second the Phillips Curve.

Okun's Law has been described as a "truly sturdy empirical regularity...that closes the loop between real output growth and changes in unemployment with stunning regularity" (Blinder, 1997: 241). Research has documented its value in an Irish context and shown that a GNP growth rate much in excess of 3.5% triggers a decline in unemployment (Leddin and Walsh, 1998). The Appendix to this article contains updated estimates of the link between changes in unemployment and output growth. The influence of UK unemployment on the dynamics of Irish unemployment is also taken into account. The results confirm that when the growth rate of GNP exceeds 3.6%, or that of GDP exceeds 4.4%, unemployment tends to fall.
Figure 1 shows how closely the Okun relationship tracks the behaviour of Irish unemployment since 1979. For every percentage point by which GNP growth exceeds 3.5%, the unemployment rate falls by a little over one quarter of a percentage point (given the level of UK unemployment). There is no evidence that this relationship changed during the "Celtic Tiger" years. It follows that two more years’ GNP growth at 7% would reduce unemployment from its present level of under 7% to under 5%. Three years' growth at 6% would have much the same effect.

This raises the question: What unemployment rate represents “full employment” under Irish conditions? This question is better restated as: At what rate of unemployment does overheating of the labour market become manifest through rising wage inflation?

The second of our basic macroeconomic “laws”, the Phillips Curve, is relevant to answering this question. The Phillips Curve depicts the association between unemployment and inflation. Originally this association was based on the historical evidence that in Britain wages rose faster when unemployment was low. This was generalised into a belief in a trade-off between inflation and unemployment. Although this relationship has been much refined over the years, it is still generally accepted that falling unemployment leads to higher inflation. Full employment is defined as the unemployment rate below which the rate of inflation tends to rise.\[^6\]

\[^6\] In Ireland the rate of price inflation is largely externally determined and the effect of unemployment is on wage inflation.
It may be argued that in Ireland the link between wage inflation and unemployment has been suspended by the Partnership approach to wage bargaining. Many commentators claim that, since the late 1980s, centralised wage bargaining between unions, employers, and government ("Corporatism") has delivered moderate nominal wage increases and preserved the economy's competitive position in the face of declining unemployment.⁷ According to this view, we are in a virtuous cycle. Wage moderation has facilitated rapid employment growth. The resulting tax buoyancy has permitted cuts in income tax rates that reinforce wage moderation and allow real take-home pay to rise faster than employers' labour costs. In recent years, cuts in income taxes have bestowed increases of 2% to 3% a year in workers' after-tax incomes over and above increases in pre-tax wage rates. Optimists see this sequence of events continuing and moderating, if not entirely averting, the traditional trade-off between falling unemployment and rising wage inflation. A more pessimistic view is that the contribution of tax cuts cannot be large enough to maintain equilibrium in the labour market if unemployment continues to fall.

At first sight the evidence from the last ten years seems to support the optimistic view. Over the period 1980-89, falling wage inflation was associated with rising unemployment and the economy traced out a conventional downward-sloping Phillips curve (Figure 2). But between the end of the 1980s, when centralised wage bargaining was reintroduced, and the mid-1990s unemployment fell and wage inflation remained low. Inflationary expectations declined and the Phillips Curve shifted leftward, markedly improving the inflation/unemployment trade-off.

**FIGURE 2: THE IRISH PHILLIPS CURVE**

---

⁷ It is, of course, possible that the return to Corporatism was due to the severity of the unemployment crisis of the late 1980s.
It is plausible to claim that during these years the Corporatist approach to wage bargaining delivered gains in employment and reduced unemployment. But it should be borne in mind that other factors – including the global collapse of inflation and the appalling level to which Irish unemployment climbed – played crucial roles in lowering inflation expectations. The most recent evidence\(^8\) shows that, with unemployment at an historically low level, wage inflation is rising markedly. This suggests that the Phillips Curve has been dormant, not dead. Now that several years of exceptional growth have mopped up the surplus labour supply and shortages are becoming widespread in the labour market, the traditional unemployment/inflation trade-off is re-emerging. If rapid output growth is maintained and unemployment continues to fall as predicted by Okun's Law, competition for the available supply of labour will lead to higher wage inflation regardless of the system of wage bargaining that is put in place.

This does not imply that the economy will revert to the situation that prevailed in the 1980s, when an unemployment rate of 7% was associated with wage inflation of over 20%. Price inflation expectations are now very low and a given rate of nominal wage increase represents a much higher expected increase in real wages than was the case twenty years ago. But we have moved beyond the horizontal segment of the Phillips Curve to the point where further reductions in unemployment will generate higher wage inflation. Increased supplies of labour – from higher immigration and labour force participation rates – are only likely to materialise as wage rates rise.

In summary, the basic constraint on Irish growth is the following well-documented sequence of events. Rapid output growth reduces the unemployment rate. After a certain point, falling unemployment generates higher wage inflation. Irish wage inflation exceeds that in other euro-zone countries and the economy's competitiveness is eroded. The growth rate falls back to the rate that is consistent with stable unemployment. This appears to be in the region of 3.5%.

**CONCLUSIONS**

This article compares the period of the “Celtic Tiger” with the longer-run record of the Irish economy. Attention is drawn to the fact that the most striking aspect of the current boom is the rapid growth of employment. The rate of growth of output per employed person has been much less impressive. Because long-run gains in living standards depend on the rate of growth of productivity, it is argued that the rate of growth of output should not be regarded as an end in itself and more attention should be paid to the growth rate of output per worker.

\(^8\) The wage data for 1996 are estimated on the basis of the indicators available at end-1996.
Alternative medium-term scenarios for the Irish economy are assessed. It is suggested that neither a super-optimistic scenario, with output continuing its recent very rapid growth, nor a pessimistic one, in which the Irish boom inevitably crashes in a hard landing, is realistic. Instead, it is more likely that the current rapid growth will be checked by well-established mechanisms. These are the links between rapid output growth and falling unemployment and between falling unemployment and rising wage inflation.

The historical evidence suggests that GNP growth in excess of 3.5% leads to falling unemployment under Irish conditions. There are no grounds for believing that this relationship changed in the course of the current economic boom. Continued rapid growth will reduce unemployment further and lower unemployment will generate higher wage inflation. There is growing evidence that this process is already underway. The Partnership approach to wage bargaining is unlikely to halt it.

Rising wage levels and a deteriorating competitive position will slow the economy's growth to a sustainable rate. The historical evidence suggests that a GNP growth rate in the range 3.5%-4% is consistent with a stable unemployment rate. This is the most plausible medium-term prospect for the economy.

REFERENCES


APPENDIX

Okun’s Law: The Evidence for Ireland

Formally Okun’s Law may be stated as follows:

\[ \Delta u = \alpha_0 + \alpha_1 g. \]

The rate of growth of output that stabilises the unemployment rate is \( g^* = \alpha_0 - \alpha_1. \)

The coefficient \( \alpha_1 \) is expected to be less than unity because the relationship between the rate of growth of output and changes in the unemployment rate is not one-to-one. Improvements in productivity allow additional output to be obtained from the same labour force. Some employment growth is required simply to absorb the growth of the labour force. And the rate of growth of the labour force varies due to changes in labour force participation and migration rates. This factor is very important in Ireland and would be expected to weaken the link between output growth and changes in unemployment. In fact it has been argued that Irish unemployment can be satisfactorily explained by the behaviour of UK unemployment alone (Honohan, 1992). However, the gap between Irish and British unemployment rates has not been constant and the growth of the economy affects the unemployment rate (Walsh, 1998).

To take account of the influence of the British labour market on Irish unemployment the change in British unemployment can be added to the basic Okun relationship:

\[ \Delta u = \alpha_0 + \alpha_1 g + \alpha_2 \Delta u_{UK} \]

Allowance may also be made for lags in the impact of changes in output on unemployment by including the lagged rate of change in output, \( g_{t-1} \), and a lagged term in the change in UK unemployment, \( \Delta u_{UK t-1} \).

Table 2 displays the results of estimating the relationship for the periods 1961-98 and 1979-98.\(^1\) By conventional statistical criteria the results are very satisfactory. The high \( R^2 \) indicates that much of the year-to-year variation in the Irish unemployment rate is explained by the model. The fit is closer when GNP, rather than GDP, is used as the output measure – perhaps reflecting the distorting effect of transfer pricing on the latter. Current and lagged output growth rates have a very significant effect on the unemployment rate. This association was closer after 1979 than over the longer time

---

\(^1\) Some points about the data should be noted. First, there are arguments for using either GNP or GDP as the output measure, so results are presented for both. The published April unemployment series has been adjusted to a January basis so that the timing of the change in unemployment, \( \Delta u \), corresponds with the annual growth rate of output, \( g \).
period. An intercept dummy variable for the "Celtic Tiger" period was not significant. The lagged change in UK unemployment is also significant and suggests that, other things being equal, a rise of one percentage point in UK unemployment would raise Irish unemployment by somewhat less than 0.5 of a percentage point. The estimates of the threshold growth rate, \( g^* \), are very stable.

### Table 2: Estimates of Okun's Law, Ireland

<table>
<thead>
<tr>
<th>Equation No.</th>
<th>( a_0 )</th>
<th>( a_1 )</th>
<th>( a_2 )</th>
<th>( a_3 )</th>
<th>( a_4 )</th>
<th>Estimate of ( g^* )</th>
<th>( R^2 )</th>
<th>D.W.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1.21</td>
<td>-0.16</td>
<td>-0.18</td>
<td>0.12</td>
<td>0.26</td>
<td>3.6</td>
<td>0.90</td>
<td>1.7</td>
</tr>
<tr>
<td></td>
<td>(5.9)</td>
<td>(3.5)</td>
<td>(4.5)</td>
<td>(1.2)</td>
<td>(2.1)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Period: 1979-98</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| 2            | 1.05      | -0.13     | -0.15     | 0.12      | 0.40      | 3.8            | 0.86  | 1.4  |
|              | (6.6)     | (4.0)     | (6.8)     | (1.4)     | (4.6)     |                 |       |      |
| Period: 1961-98 |           |           |           |           |           |                 |       |      |

| 3            | 1.41      | -0.13     | -0.19     | 0.08      | 0.37      | 4.4            | 0.82  | 1.2  |
|              | (4.1)     | (2.1)     | (3.1)     | (0.6)     | (2.3)     |                 |       |      |
| Period: 1979-98 |           |           |           |           |           |                 |       |      |

| 4            | 1.14      | -0.12     | -0.14     | 0.10      | 0.47      | 4.4            | 0.80  | 1.2  |
|              | (5.2)     | (3.0)     | (3.4)     | (0.9)     | (4.5)     |                 |       |      |
| Period: 1961-98 |           |           |           |           |           |                 |       |      |

**Notes:**

i. \( g^* \) is the rate of growth of output at which the Irish unemployment rate stabilises for a given level of UK unemployment.

ii. When an error correction term was added to equation 1 its coefficient was very small (-0.06) and non-significant (t-stat = 0.9).

iii. \( g^* \) is not exogenous. Changes in unemployment affect the growth of output, as well as vice versa. Allowing for simultaneity does not materially alter the estimates of \( g^* \).