



BANK OF ENGLAND

# Speech

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## **Do we have a New Economy?**

Speech given by

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## **SUMMARY**

### **1 RECENT EVENTS**

The acts of terrorism this week in the US were both tragic and unexpected. If these events did appear to lead to a significant deterioration in consumer confidence, monetary policy can reasonably be expected to respond. However, in the longer-term, the underlying strengths of the US economy are undiminished. Today, we are here to discuss the longer-term forces that have affected our economies in recent years.

### **2 DEFINITION OF A ‘NEW ECONOMY’ (NE)**

A NE is defined to be one where structural changes like a significant fall in the equilibrium rate of unemployment and/or a significant increase in the potential growth rate of the economy might have occurred. These could have been driven by many factors, of which Information and Communications Technology (ICT, hereafter) advances are only one. Such structural changes typically lead to a breakdown of the historical econometric relationships that help inform the setting of monetary policy, which then implies that the actual economy appears to be “new” relative to the description of the economy embedded in our models.

### **3 SOME CROSS-COUNTRY EVIDENCE ON FORECASTING ERRORS**

Since the early 1990s, forecasters have, on average, simultaneously underestimated GDP growth and over-estimated inflation in the US and the UK, which is suggestive of structural changes having occurred. However, since this is not true of the rest of the G5, whether or not you believe there is a NE depends crucially on which country is being discussed.

Evidence from the UK suggesting that structural relationships determining wages and prices appeared to break down in the 1990s is presented. In the context of the Bank of England’s medium-term macroeconomic model (MTMM, hereafter), understanding why these equations broke down is very important to forming a judgment about where inflation is headed. This is illustrated by showing that alternative treatments of the past price forecast errors of this model could, mechanically, easily yield prospective inflation forecasts ranging between around 1% to around 5%.

#### **4 HAS THE NAIRU FALLEN?**

One possible explanation for the pattern of observed forecast errors in the US and the UK is a fall in the non-accelerating inflation rate of unemployment (NAIRU, hereafter). Others point to non-NE factors like lower import prices. Econometric evidence suggests that the NAIRU fell significantly in both the US and the UK, even after one allows for the beneficial influence of lower import prices. There is no evidence suggesting a comparable fall in the NAIRU in the rest of the G5.

#### **5 THE NE AND PRODUCTIVITY GROWTH**

Most studies now concur that the US has experienced a significant increase in its underlying rate of productivity growth, and that the production and use of ICT have both contributed to this rise. Some authors have argued that the rise in welfare has probably lagged behind the rise in productivity because the aggregate depreciation rate has risen. They suggest that one should use Net Domestic Product (NDP) rather than Gross Domestic Product (GDP) to measure productivity. However, the post-1995 acceleration in a measure of welfare (suggested by Professor Weitzman) is even greater than that in official, GDP-based measures of productivity, suggesting that the post-1995 US performance remains impressive.

Among the G5 countries, the US is the only country to have experienced a significant increase in labour productivity growth, even though the contribution to growth from ICT capital has risen elsewhere. This deserves further research.

#### **6 EXPLAINING WHY THE PRICE EQUATIONS HAVE BROKEN DOWN**

The evidence presented for the UK suggests that one reason conventional price equations have tended to predict out-turns higher than actually materialised is, in part, because of an intensification of product market competition. However, non-NE factors like the higher-than-expected exchange rate have also played a role.

A new price equation which allowed for such additional influences has the advantage of there being less need to choose between alternative treatments of past forecast errors, which, as was noted above, can lead to rather large differences in the inflation forecast.

In addition, the measure of capacity utilisation embodied in the Bank's model appears in recent years to have suggested rather higher levels of capacity use than would be implied either by survey measures or a measure based on an alternative concept of the capital stock, and might therefore have overstated the degree of inflationary pressure.

## **7 THE NE AND THE CURRENT CONJUNCTURE**

With internet-related stock prices down very significantly, and a global economic downturn, there is much questioning of the NE. This is in part because some more extreme adherents of the NE made the extravagant claim that recessions were a thing of the past. Yet, historical evidence suggests that very significant volatility in share prices and corporate investment is not unusual around periods of rapid technological change. Given the existing investment overhang, and the vulnerability of equity markets, the global economy probably has a difficult period ahead of it. The tragic events this week obviously increase the near-term risks to the global economy.

However, this does not diminish the fact that, consistent with the NE view, some gains have been made in the US and the UK.

## 1 INTRODUCTION

The acts of terrorism this week in the US were both tragic and unexpected. If these events did appear to lead to a significant deterioration in consumer confidence, monetary policy can reasonably be expected to respond. However, in the longer-term, the underlying strengths of the US economy are undiminished. Today, we are here to discuss the longer-term forces that have affected our economies in recent years.

The very significant fall in internet-related stock prices, the global economic slowdown and the fall in corporate investment appear to have led many to assert either that we never had a New Economy (NE, hereafter), or that the NE is now dead. There is however, no generally accepted definition of what one means by the NE.<sup>1</sup> There are those who see the NE as being synonymous with an acceleration in the diffusion of Information and Communications Technology (ICT - see, eg Gordon (2000)). However, I regard that as a rather narrow definition. Indeed, much that might be different about the economy today relates not just to ICT advances, but also to the effects of globalisation, intensifying product market competition, labour market reform, financial market liberalisation and several other factors.

I am primarily interested in the possibility that these factors have reduced the equilibrium rate of unemployment and/or increased the potential growth rate of the economy. Typically, such structural changes lead to a breakdown of the historical econometric relationships that are embedded in many of the models that help inform the setting of monetary policy. This then makes the economy appear to be “new” or “different” relative to the description of the economy that resides in many of our models.<sup>2</sup> What I will not discuss today is the version of the NE hypothesis which asserts that the world has changed so much that one now needs a new kind of economics to analyse it (see, eg Kelly (1998)).<sup>3</sup>

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<sup>1</sup> See Browne (2000) for an extensive discussion of this issue.

<sup>2</sup> This definition appears similar to one adopted by Chairman Greenspan, who, earlier this year, in testimony before the Senate Banking Committee (23 February 2001) said “it is certainly true that we have a new economy. It is different. It is behaving differently and it requires a different type of monetary policy to maintain its growth than we had in the past.”

<sup>3</sup> Stiroh (2001) contrasts a moderate interpretation of the NE, which only refers to changes of parameters in the context of existing economic theories with a more extreme version of the NE which suggests that basic economic relationships have changed, and, therefore, a reworking of economic theory is required. His preferred definition is similar to the one adopted here.

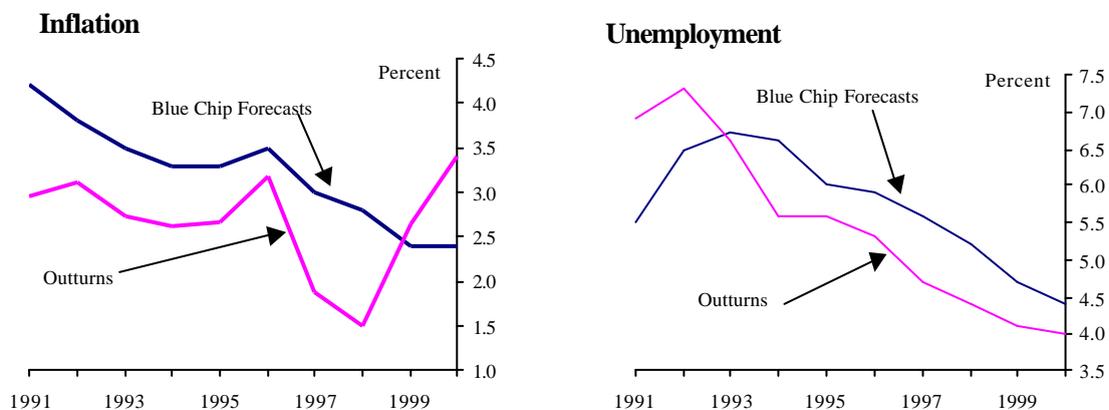
I shall therefore discuss today some of the important ways in which some of our economies seem to be operating differently as compared to, say, the seventies and eighties. Although I do not believe some of the more extravagant claims that are made for the NE, my best guess is that enough has changed for it to be material to the setting of monetary policy. Indeed, many of us were driven to looking more carefully at the NE hypothesis because some relationships used for forecasting purposes appeared to break down.

## 2 THE RECENT FORECASTING RECORD – SOME CROSS-COUNTRY EVIDENCE

In recent years, economists and central bankers alike have devoted much time to investigating the possibility that some of the parameters of the historical economic relationships that we rely on may have shifted. This is because, in some countries, forecasts of inflation, unemployment and GDP growth have been systematically biased.

Figure 1 compares the forecasts by Blue Chip panellists for unemployment and inflation in the US as compared to the actual out-turns over the 1993-2000 period.<sup>4</sup>

**FIGURE 1**



<sup>4</sup> Kohn (1999) presented a similar picture of the 1991-97 period.

Note that forecasters have, for most of the period, over-predicted the level of the unemployment rate in the US. Nonetheless, they have simultaneously over-predicted inflation until recently.

A conventional view holds that if the unemployment rate is lower than expected over a sustained period of time, then this is a symptom of excess demand and so,<sup>5</sup> on average, actual inflation must also be higher than expected. However, the actual inflation out-turn over this period was, on average, lower than the ‘consensus’ inflation forecast.

Table 1 displays more formal evidence on forecast errors for the G5 countries.<sup>6</sup> The first two columns report the average forecast error for each country and associated t-statistics based on a simple regression.<sup>7</sup> The final column in Table 1 reports an alternative test, which also considers whether the unit coefficient on the forecast is a valid assumption.<sup>8</sup>

Taking the UK first, a similar pattern to the US emerges. On average, the consensus forecast has underestimated GDP growth by as much as 0.5% pa over the period, while simultaneously over-estimating inflation by around the same amount. Moreover, these forecast errors are statistically significant even when one allows for the fact that successive forecasts are not independent of each other.

The degree to which the consensus has underestimated GDP growth in the US is even greater (around 1%), with the average degree to which inflation has been over-estimated smaller at around -1/4%.<sup>9</sup>

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<sup>5</sup> Conditional on the equilibrium rate of unemployment having remained constant.

<sup>6</sup> I am grateful to Nick Davey and Jennifer Greenslade of the MPC Unit at the Bank for their help with this work.

<sup>7</sup> A simple way to consider bias involves testing the hypothesis that  $\mathbf{a} = 0$  in the regression  $A_t - {}_{t-i}F_t = \mathbf{a} + \mathbf{e}$ , where  $A$  is the actual outturn for GDP growth or inflation and  $F$  is the forecast for this period made at time  $t-i$  ( $i=4$ ).

<sup>8</sup> This involves a joint Wald test of the null hypothesis that  $\mathbf{a} = 0$  and  $\beta = 1$  in the regression  $A_t = \mathbf{a} + {}_{t-i}\mathbf{b}F_t + \mathbf{e}$ .

<sup>9</sup> Note that if one were conducting this exercise for the period 1993-1999, then the average forecast error for inflation would be almost -1/2%, which is significant at the 1% level of testing.

Once we move away from the Anglo-Saxon countries, the consensus forecasts appear to have been more accurate or at least more readily explicable. If anything, forecasters of the Japanese economy have been too optimistic about GDP growth, rather than too pessimistic. Inflation forecasts for Japan have, on average, showed no significant bias. A similar picture emerges for Germany, where average inflation has

**TABLE 1**

**AVERAGE FORECAST ERRORS<sup>1</sup>, 1993-2001<sup>2</sup>**

	Average	t-statistic <sup>4</sup>	Joint Wald test <sup>4</sup>
	Error	[probability]	F-statistic [probability]
<u>UK</u>			
Output Growth	0.51%	2.07 [0.046]	10.84 [0.000]
Inflation	-0.45%	-2.39 [0.023]	5.92 [0.007]
<u>US</u>			
Output Growth	0.97%	2.96 [0.006]	30.95 [0.000]
Inflation	-0.24%	-1.27 [0.212]	11.78 [0.000]
<u>JAPAN</u>			
Output Growth <sup>3</sup>	-0.37%	-0.83 [0.410]	5.30 [0.010]
Inflation	-0.18%	-1.32 [0.195]	1.32 [0.281]
<u>GERMANY</u>			
Output Growth <sup>3</sup>	-0.04	-0.10 [0.921]	10.60 [0.000]
Inflation	-0.15	-0.69 [0.493]	0.30 [0.745]
<u>FRANCE</u>			
Output Growth <sup>3</sup>	-0.37	-0.96 [0.345]	1.28 [0.291]
Inflation	-0.38	-2.50 [0.017]	28.34 [0.000]

- 1 Four quarter-ahead forecast errors based on consensus forecast taken from 'Consensus Economics'. The forecasts for output are initially GNP and then GDP is used. For inflation, CPI is used except the UK which is RPI until 1996 Q4 and then RPIX. The forecasts are evaluated against the relevant measure.
- 2 Sample period 1993 I-2001 II, unless otherwise stated.
- 3 Sample period 1993 I-2001 I.
- 4 Using Newey-West standard errors, which are robust to serial correlation.

only been over-estimated to a rather modest degree and the average GDP forecasting error has been close to zero. Finally, there is statistically significant evidence that the consensus forecast in France has tended to over-estimate inflation (by around 0.4% pa) since 1993. However, unlike the US and the UK, this over-prediction of inflation has been accompanied by a tendency to simultaneously over-estimate GDP growth as well (though not at a statistically significant level), so that a tendency for growth to come in lower than expected might well explain the tendency for inflation to also surprise on the downside.

The evidence on forecasting errors suggests that “something different” might have happened to historical economic relationships in the US and the UK in the 1990s, but there is no evidence of this being true for the rest of the G5. This may explain why financial markets and central bankers alike have been more interested in the possibility of a NE in the US and the UK, rather than in continental Europe or Japan.<sup>10</sup> Whether or not you believe there is a NE depends crucially on which country is being discussed.

### **3 THE RECENT BEHAVIOUR OF CONVENTIONAL PRICE EQUATIONS: SOME ECONOMETRIC EVIDENCE**

The tendency for economic forecasters in the US and the UK simultaneously to under-predict growth and over-predict inflation is potentially consistent with a breakdown in the structural relationships that underlie our forecasting processes. NE-style hypotheses that could explain such a breakdown include changes in the equilibrium rate of unemployment, the underlying rate of productivity growth, or the degree of competitive pressure. Therefore I turn to an examination of the evidence for a breakdown of “structural” relationships next.

Purely for illustrative purposes, note that the Medium-Term Macroeconometric Model (MTMM, hereafter) used at the Bank of England (see Bank of England (2000)) has a conventional specification for prices (the GDP deflator) as a function of unit labour

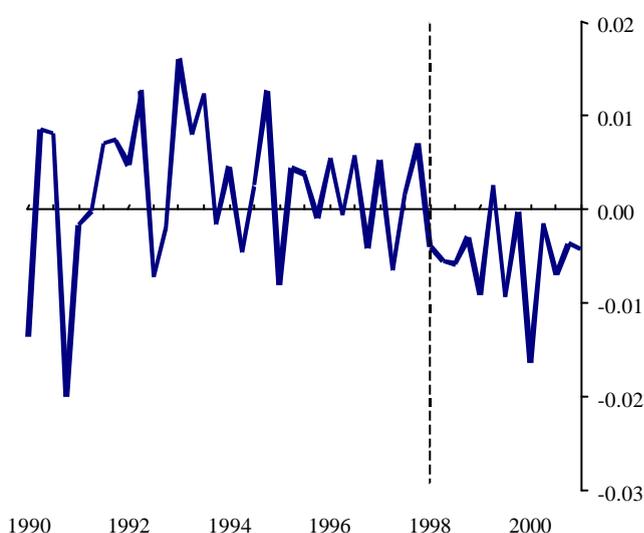
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<sup>10</sup> This might also explain why the US dollar and sterling have appreciated against the European currencies and the yen. See Wadhvani (1999) for further discussion of this possibility.

costs and capacity utilisation. In recent years, there has been a persistent tendency for prices to come in below what the conventional determinants have predicted – specifically, note the tendency for the residuals to be negative since around 1998 in Figure 2. Further, these residuals are statistically significantly different from zero (a t-test since 1998:1 yields a value of  $-2.19$ ).

**FIGURE 2**

**PGDP Equation Residuals**



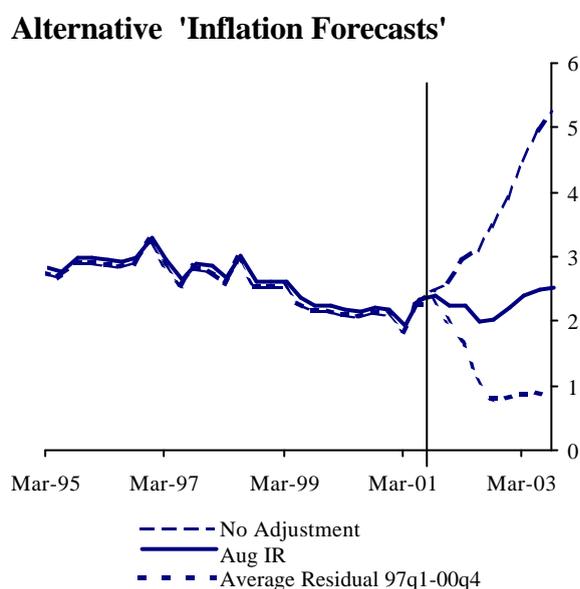
These residuals are also economically significant. Understanding why this particular equation has significantly over-predicted inflation in recent years is very important to forming a judgment about where inflation is headed. For example, if we made no additional adjustments, but just used the price equation mechanically,<sup>11</sup> then, other things being equal, the resulting inflation forecast in the August 2001 round would have been around 5% rather than just under 2.5% (see Figure 3). Indeed, depending on the precise judgment made about the treatment of the residuals on this equation, an alternative assumption that the recent average level of the residual since 1997 persists generates an overall inflation forecast as low as around 1%. I do want to emphasise

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<sup>11</sup> The only adjustment that is retained for this simulation (which was carried out within the MPC Unit) is one relating to the treatment of past GDP revisions. Removing this adjustment would yield an even higher inflation forecast.

that, of course, the published inflation forecast is not just based on the output of an econometric model, but is based on the judgment of the Committee.<sup>12</sup>

**FIGURE 3**



The recent persistent overprediction of UK inflation does not appear to be restricted to just the above equation for the GDP deflator in the UK. Other structural relationships also appear to have broken down. It is notable that if one takes the wage equation that is to be found in the MTMM, then there is evidence that it has over-predicted wage growth in recent years (ie since around 1992).<sup>13</sup>

#### **4 HAS THE NAIRU FALLEN?**

A fall in the so-called non-accelerating inflation rate of unemployment (NAIRU, hereafter) for labour market related reasons is an example of a structural change which might partially explain the pattern of observed forecast errors in the US or the

<sup>12</sup> Given the extraordinarily wide range of forecasts that can be produced by alternative assumptions about adjustments made to this poorly performing price equation, it is hardly surprising that one might want to inform one's judgment by using a price equation that has performed better. Such an equation is discussed in Section 6 below, and represents one reason why I, personally, had a projection for inflation that differed from the best collective projection in the last Inflation Report.

<sup>13</sup> See, eg Wadhvani (2000a).

UK. Of course, an intensification of product market competition, would also, lower the NAIRU, and I shall discuss this possibility in a later section.

Certainly the recent performance of the labour market in the US and UK has been impressive. One striking feature of recent US experience is that, over the period 1992-2000, the rate of price inflation was essentially constant even though unemployment fell from 7.5% in 1992 to 4.1% in 1999. Moreover, when the unemployment rate first fell below 6% (the then prevailing 'consensus' estimate of the NAIRU), many economists predicted an acceleration in inflation which failed to materialise. UK experience has been quite similar. In 1995, the consensus estimate of the NAIRU was that it was around 6½ - 7% (using the claimant count definition). Yet, unemployment has fallen steadily to the current 3.2% without, as yet, triggering any discernible rise in inflation.

Of course, various alternative hypotheses have been advanced in an attempt to explain these facts. In the US, they include:-

- a) Temporary factors It is argued that lower import prices (associated with a higher dollar, the Asian crisis etc) and decelerating health insurance costs have played an important role in temporarily depressing inflation, and that the NAIRU is actually higher than the current unemployment rate.<sup>14</sup> A variant of this view argues that the acceleration of productivity growth in the 1990s has not, as yet, been fully reflected in wages because wage aspirations respond slowly to increases in productivity growth.<sup>15</sup> As aspirations catch up, inflation will rise so the fall in unemployment may only be partially sustainable.
- b) Permanent Factors One might expect the fall in unemployment to be sustainable if the NAIRU has actually fallen for NE-type reasons. In terms of the labour market, changes in how people look for work (eg temporary help agencies), or

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<sup>14</sup> See, eg Blinder and Yellen (2001).

<sup>15</sup> See, eg Ball and Moffitt (2001).

differences in the demographic composition of the workforce have been suggested as possible explanations for a fall in the US NAIRU.<sup>16</sup>

Turning to the UK, I have previously discussed the far-reaching changes that have occurred in the labour market over the last two decades (see Wadhvani (2000a)), so I will not have much to say on that topic today. Union membership and strike activity are much lower. Imbalances in the pattern of labour demand and supply have diminished significantly. Turning to the unemployment benefits regime, the conventional replacement ratio (ie the ratio of out-of-work benefit to estimated in-work income) has fallen. Further, the New Deal and other measures which have tightened the availability of benefits have also probably been influential. Of course, none of this is to deny that, as in the US, lower import prices have also played a role.

Various approaches have been used over time to estimate the NAIRU.<sup>17</sup> One approach that has become more popular in recent years is to use Kalman filter techniques to estimate a time-varying NAIRU jointly with a Phillips curve. Staiger, Stock and Watson (2001) argue that their Kalman filter based estimate of the time-varying NAIRU in a price-based Phillips curve for the US fell by about 1.6 percentage points over the 1992-2000 period. Interestingly, their estimate of the decline in the NAIRU is relatively insensitive to the inclusion/exclusion of the supply shock variables.

Figure 4 displays Kalman filter-based estimates of the time-varying NAIRU from a price-based Phillips curve for the UK since 1993.<sup>18</sup> Note that, on these estimates, the NAIRU has fallen from around 9% in early 1993 to around 5½% in mid-2001,<sup>19</sup> even though this price equation allows for temporary factors like import prices and oil prices. As has been pointed out in various studies (including Staiger, Stock and

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<sup>16</sup> See Katz and Krueger (1999) for a discussion of some of these hypotheses in the US and Barwell (2000) for the UK.

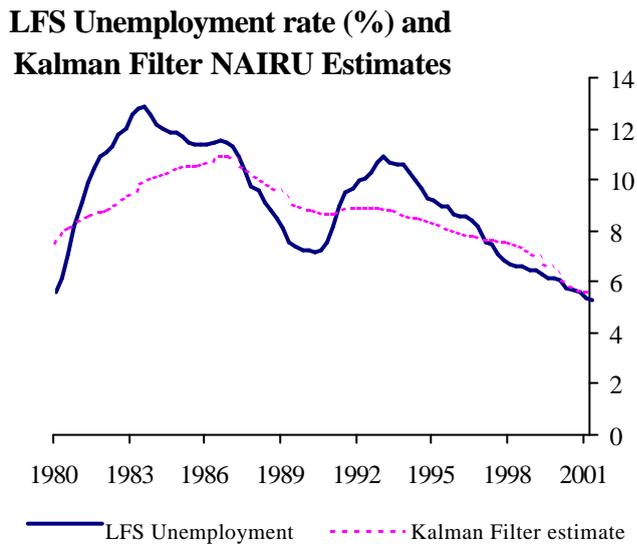
<sup>17</sup> See Coulton and Cromb (1994) or Robinson (1997) for various estimates.

<sup>18</sup> This estimation has been done by Jennifer Greenslade in the External MPC Unit (based on updating previous joint work with Jumana Saleheen and Richard Pierse). It assumes a signal-to-noise ratio, (which measures the volatility or variance of the NAIRU relative to the variance of changes in inflation) of 0.16.

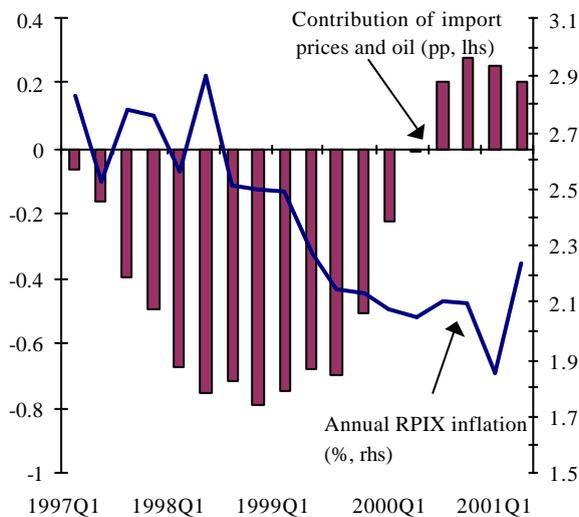
<sup>19</sup> Using the LFS definition of unemployment. Note that if the signal-to-noise ratio were set at 0.09, so that the NAIRU would be less volatile, the NAIRU would still show a marked fall of almost 2.5 percentage points over the 1993 to mid-2001 period.

Watson (1997) and Cross, Darby and Ireland (1997)), NAIRU estimates (using a variety of techniques) have very large standard errors around them, and so should be used with care. However, interestingly, my colleague Stephen Nickell, using a different method, recently concluded<sup>20</sup> that the NAIRU had fallen from an average of just under 9% in 1991-97, to around 5¾% over 1997-2000.

**FIGURE 4 – ESTIMATES OF THE NAIRU IN THE UK**



**FIGURE 5 – CONTRIBUTION OF IMPORT PRICES AND OIL PRICES TO UK INFLATION (RPIX)**



<sup>20</sup> See Nickell (2001).

Of course, all methods of estimating the NAIRU are pretty imprecise, and, for policy purposes one is not just interested in the estimate of the NAIRU today, but also in how it might evolve over the next few years.

Recall that many observers have argued that the apparent improvement in the wage-unemployment trade-off during the late 1990s was largely attributable to temporary factors like lower import prices. Figure 5 displays the estimated contribution<sup>21</sup> of oil and import prices to UK inflation, and the actual inflation rate. Note that the estimated contribution of these external factors has switched from being highly negative in 1998-99 to being positive in recent quarters. Yet price inflation has remained broadly trendless over this period. Since inflation has stayed low even as the temporary factors have reversed, the model attributes the low inflation to a decline in the NAIRU.<sup>22</sup>

While there is compelling evidence that the NAIRU fell significantly in the US (by around 1½%) and the UK (perhaps by 3-3¼%) during 1992-2000, few believe that the NAIRU fell by much, if at all, in the rest of the G5 during the 1990s as a whole. For example, the recent *OECD Economic Outlook* suggests that the NAIRU rose sharply in Japan in the second half of the 1990s, whereas in Germany there was a marginal rise during this period. For France, the OECD estimate that there was a fall during the second half of the 1990s, broadly offsetting the increase that the OECD estimate took place earlier in the decade.

## **5 THE NEW ECONOMY AND PRODUCTIVITY GROWTH**

### **5.1 THE RECENT RISE IN US PRODUCTIVITY GROWTH**

The rise in US productivity growth since 1995 is one of the most eye-catching aspects of the NE. Official estimates suggest that average labour productivity rose from around 1.4% per annum during 1973-95 to around 2.5% per annum over 1995-2000.<sup>23</sup>

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<sup>21</sup> From the estimates of a price Phillips curve.

<sup>22</sup> Note that most economists did not predict the extent of any such possible fall in the NAIRU. Indeed, preliminary analysis of the MPC's forecast errors since 1997 concluded that we had failed to anticipate a fall in the NAIRU.

<sup>23</sup> Output per hour for the non-farm business sector.

Until the recent data revisions, labour productivity growth for 1995-2000<sup>24</sup> was estimated to have grown at an even higher rate of 2.8% pa. At first sight, the new slightly lower estimate remains impressive. A large number of academic studies have investigated this rise in productivity growth.<sup>25</sup>

As long ago as 1995, the argument was made in some quarters that the NE had led to an acceleration of productivity growth in the US. This view was initially resisted by many economists.<sup>26</sup> Then, the view gradually evolved as a mixture of data revisions and the passage of time appeared to lead to a discernible change in the trend rate of measured productivity growth. Even then, there was some further resistance to accepting the possibility of a change in the rate of structural productivity growth. The rise in actual productivity growth was initially characterised as cyclical, then said to be confined only to the ICT-producing area, and then only to the durables manufacturing sector and so on.<sup>27</sup>

Suffice it to say that now a majority of the more recent studies agree that both the production and the use of information technology (IT, hereafter) have contributed substantially to the rise in US productivity growth. Moreover, Stiroh (2001), supports a moderate NE interpretation of the productivity upsurge in arguing that -

**“The recent productivity gains largely reflect familiar economic forces like technological progress, input substitution, and capital deepening, and there is little evidence that the gains reflect extreme new economy concepts like spillovers, increasing returns, or network effects.”**

## **5.2 THE RISE IN US PRODUCTIVITY GROWTH IN A HISTORICAL CONTEXT**

Of course, one must recall that the post-1973 period was one of relatively slow productivity growth which spawned a large number of studies which attempted to explain the US productivity “slowdown” that occurred from around that date. Hence, the post-1995 acceleration of growth has occurred in the context of productivity growth having been weak in the preceding period. The spurt in productivity growth

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<sup>24</sup> ie the average of the annual growth rates for 1996-2000.

<sup>25</sup> Bosworth and Triplett (2000) or Stiroh (2001) both provide excellent surveys of the recent literature.

<sup>26</sup> A representative view was that of Blinder (1997), who characterised it as “mostly poppycock”.

<sup>27</sup> See Gordon (2000) for discussion of some of these issues.

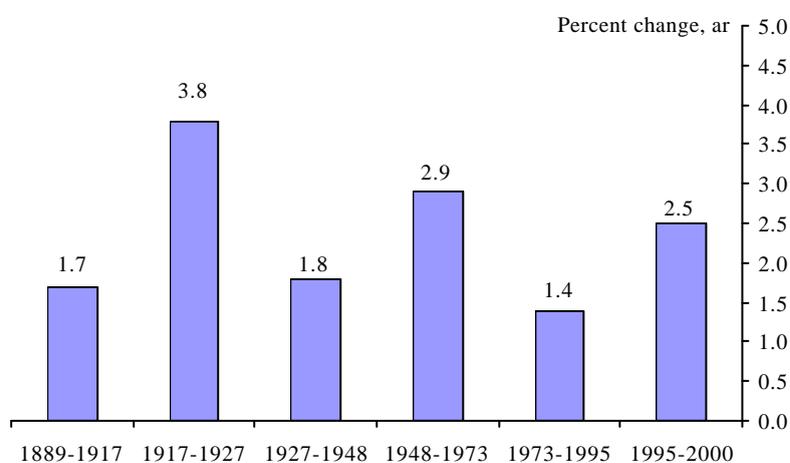
since 1995 is by no means historically unprecedented, eg non-farm business productivity grew faster in 1960-65 than in 1995-2000.

However, from a policy-making perspective, what matters is not whether the rate of productivity growth is historically unprecedented. Instead, if the rate of structural productivity growth changes relative to its recent historical past, and is likely to persist for a few years, it is likely to have an impact on many of the econometric relationships that we typically rely on.

It is therefore interesting that Laurence Meyer of the Board of Governors (see Meyer (2001)) has argued recently that the economic history of the US can be viewed as a series of productivity cycles, ie relatively long periods of higher and then lower productivity growth. Figure 6 illustrates. Note that although over the entire 1889-2000 period, productivity growth averaged about 2 per cent, there were several relatively long-lasting periods when productivity growth was either significantly above or below this long-term average. From a policy-making perspective, it is important to know whether one has made a transition from a “low” productivity growth period (eg the 1973-95 average of 1.4%) to a “high” productivity growth period (eg the average of 2.5% since 1995). Setting policy on the basis of the long-term average growth rate of 2% would imply that policy was always inappropriate.

**FIGURE 6: US PRODUCTIVITY**

**Labour Productivity Growth: The Long View**



Source: Meyer (2001), updated using latest BLS figures where available

Although the growth rate since 1995 is not exceptional by comparison with other “high” productivity growth periods, the contribution of ICT to productivity growth is, by historical standards, impressive. It is therefore significant that Crafts (2000) argues that “... the growth contribution of ICT in the past 25 years outstrips that of electricity and even more so that of railroads over comparable periods ....”. This is documented in Table 2, which shows that even before the post-1995 period, the contribution of ICT to growth compared favourably relative to these other innovations.

**TABLE 2**

**RELATIVE CONTRIBUTION OF DIFFERENT TECHNOLOGIES TO US GROWTH (percentage points per year)**

	1974-90	1991-95	1996-99
ICT	0.65	0.76	1.54
	1839-70	1839-90	
RAILROADS	0.21	0.35	
	1894-1929	1919-29	
ELECTRICITY	0.56	0.98	

Source: Crafts (2000)

**5.3 A DIGRESSION – DOES A HIGHER DEPRECIATION RATE MAKE THE US PRODUCTIVITY SURGE LESS IMPRESSIVE?**

As we have discussed above, an investment boom in IT has significantly contributed to the productivity acceleration in the US. Since computers and software have relatively short economic lives, and the share of IT investment in total investment has risen, this has contributed to a rise in the aggregate depreciation rate. This has led some authors (eg Kay (2001)) to question whether welfare is rising at the same rate as productivity.

Conventionally, most analysis of productivity trends is based on Gross Domestic Product (GDP) numbers. The part of gross investment that simply maintains the productive capacity of the existing capital stock at its current level does not add to welfare. This suggests that to measure welfare we should subtract depreciation

(capital consumption) from GDP to obtain Net Domestic Product (NDP). In addition, Professor Weitzman of Harvard University argues that an alternative measure of Net Domestic Product (WNDP)<sup>28</sup> is likely to provide an even better measure of welfare. At first sight, one would think that a rising aggregate depreciation rate would imply that the gap between GDP and WNDP growth would be widening over time. However, the relationship between GDP and WNDP growth is more complex. Although the aggregate depreciation rate has risen, depreciation as a proportion of GDP has been approximately flat. In practice, net investment growth has accelerated by more than the growth of gross investment (Table 3).

**TABLE 3  
ACCELERATION IN GROWTH, 1995-99 VERSUS 1973-95**

	1973-95	1995-2000	Acceleration 1995-2000 vs. 1973-95
Gross Investment	2.87	8.82	5.95
Net Investment	0.94	12.31	11.37
GDP	2.75	4.02	1.27
WNDP	2.41	3.83	1.42

That, in part, explains why the acceleration in a measure of welfare (ie WNDP growth) in the post-95 period is even greater than that in productivity growth (ie GDP). Hence, if anything, the rise in welfare is even more impressive than the rise in official measures of productivity growth.

#### **5.4 PRODUCTIVITY GROWTH – THE INTERNATIONAL EXPERIENCE**

If, as we have noted above, investment in IT is an important part of the productivity surge in the US, and the IT revolution is a worldwide phenomenon, it may then be reasonable to investigate whether a similar IT-associated surge in productivity growth

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<sup>28</sup> Weitzman's measure of Net Domestic Product is consumption plus net investment, deflated by the price index for consumption. Official measures of Net Domestic Product tend to measure real investment by using a price index for investment.

has occurred outside the US. To the extent that higher than-expected productivity growth in the US can explain the tendency for economic forecasters to simultaneously under-predict GDP growth and over-predict inflation, it is of some interest to examine whether a similar phenomenon has been at work elsewhere.

At first sight, one finds no echo of the US productivity surge elsewhere. Among the G5 countries a comparison of the post-1995 period with the 1973-95 period suggests that the US is the only country exhibiting a significant increase in labour productivity growth; indeed, it appears to have slowed in France, Japan and the UK (see Table 4).

There are those who attribute at least some of this difference to the fact that measurement conventions regarding both hedonic pricing and the classification of software spending vary across countries (see, eg Vanhoudt and Onorante (2001)).

A study for the UK that attempted to restate UK labour productivity using US measurement conventions (see Oulton (2001a)), found that over the period 1994-98, labour productivity growth might have been about ? % pa faster than has been recorded in the official data. However, even on the adjusted data, the UK fails to display the productivity acceleration seen in the US.

**TABLE 4**  
**LABOUR PRODUCTIVITY GROWTH IN THE G5 COUNTRIES <sup>1</sup>**

	(% pa)	
	1973-1995	1995-2000
US	1.0	2.5
UK	1.8	1.6
Japan	2.3	1.3
Germany	2.0	1.1
France	1.9	1.2

<sup>1</sup> Output per person employed.

Table 5 sheds some light on the differences between the US and the UK. It shows that while the contribution to growth from ICT capital has risen in both the US and the UK, the main difference in the late 90s between the two countries lies in the contribution to growth of “other capital” and that of total factor productivity (TFP) growth. It is possible that the high level of the pound depressed investment in “other capital” while the absorption of those who had been unemployed for a long period of time into the workforce may have depressed TFP growth. Hence, it would appear that the benefits of the ICT revolution on productivity have, so far, been obscured by other factors in the UK, though this issue clearly deserves further research.

Interestingly, the phenomenon of a rising growth contribution of ICT co-existing with lower labour productivity growth for some other reason does not appear to be confined to the UK. If one considers the host country of this conference, Finland, then Jalava and Pohjola (2001) remind us that it ranks among the top countries in the world in terms of the number of internet hosts and mobile phones per capita. It is also one of the leading ICT producers in Europe. However, labour productivity growth in the 1995-99 period is actually a little lower than in the 1975-95 period.

The growth accounting exercise presented in Jalava and Pohjola (2001) suggests that the contribution to growth of production and use of ICT has increased significantly during the 1990s. However, this has been offset by a significant fall in the contribution to growth of “other capital”, which the authors attribute to an “inefficiently” high level of the pre-existing non-ICT capital stock.

Hence, to conclude, the data that we have so far do not suggest that higher labour productivity growth outside the US is the reason why some of the economic relationships appeared to change in some countries. It remains possible that measured productivity growth in some of these countries (eg the UK) significantly understates true productivity growth (see, eg Wadhvani (2000b)). Alternatively, it is possible that the reasons for the apparent breakdown of some of the key economic relationships lie elsewhere.

**TABLE 5****PRODUCTIVITY AND THE CONTRIBUTION OF ICT:  
A US-UK COMPARISON**

	US <sup>1</sup>			UK		
	1974-90	1990-95	1995-99	1979-89	1989-94	1994-98
Growth of Output per hour (% pa)	1.37	1.53	2.57	2.75	3.01	1.48
Growth of output (% pa)	3.06	2.75	4.82	2.46	1.35	3.09
Contributions from (pp pa)						
ICT capital	0.44	0.51	0.96	0.37	0.40	0.64
Other capital	0.37	0.11	0.14	0.68	1.10	0.08
TFP plus labour quality	0.55	0.92	1.47	1.70	1.51	0.75

Source: US: Oliner and Sichel (2000)

UK: Oulton (2001a)

1 US data do not include the latest data revisions.

**6 AN INTENSIFICATION OF PRODUCT MARKET COMPETITION?**

A commonly cited reason as to why some of our economies might be behaving differently is that the degree of product market competition has intensified over the last few years. I shall attempt to evaluate the validity of this claim in a UK context. Unfortunately, we do not have a direct measure of “product market competition”, so econometric testing is difficult.

A contributory factor may be globalisation, ie the increasing integration of global product markets. Figure 7 suggests a striking increase in the degree of import penetration in the UK, with the rate of increase having accelerated in recent years.<sup>29</sup>

In the UK, evidence of increased product market competition has not just been confined to globalisation. Government action has also played a role here. Privatisation and/or regulatory changes in a whole host of industries including gas, water, telecom, electricity, airports, rail, the docks and broadcasting have led to rather more competitive product market conditions.

A crude proxy for the extent of perceived competitive pressure is to rely on survey evidence. The Euler Trade Indemnity survey (which spans all the broad industry sectors) has asked questions relating to the extent to which price discounting and the

## FIGURE 7

### Import Penetration in the UK



competitive environment have been perceived as impacting on profitability since 1994. Figure 8 displays the responses. Note that a response below 50 suggests that the factor is having a negative impact on profitability. The responses appear to point to an intensification of perceived competitive pressures and the extent of discounting

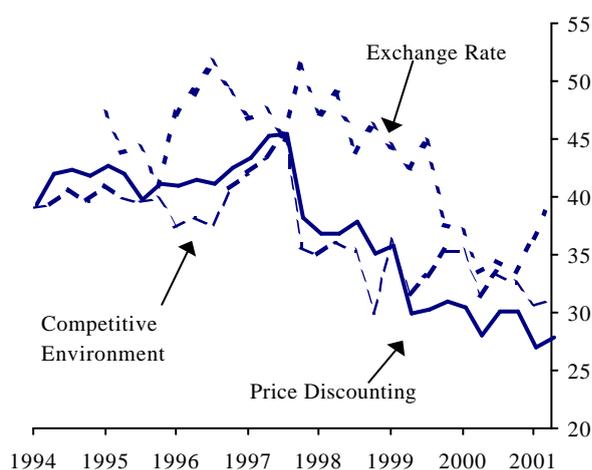
<sup>29</sup> Note also that over the same period, world trade growth has, of course, also risen at a much faster rate than world GDP growth, which is indicative of globalisation. For example, the ratio of world imports to world GDP was, in 2000, about 70% higher than its 1980 value.

over this period, (dating back to around mid-1997), as they have fallen further below 50, suggesting a greater negative impact on profitability. Note that while the level of the exchange rate has also been hurting profitability, its effect is deemed to have been less important than that emanating from price discounting or the more competitive environment.

It is sometimes asserted that an intensification of competition is a one-off event and must therefore only have a transient effect on inflation. Consequently, the argument goes, it should not affect one's perception of the medium-term outlook for inflation. My ex-colleague, Willem Buiters (2000) argues that a fall in the NAIRU which was associated with intensified product market competition would not, of course, reduce inflation in the long-run, but he emphasises that there would be important short-run effects. Of course, the "short-run" in this case could last several years, since there can sometimes be a gradual improvement over a number of years in the structural factors that lower the NAIRU.

**FIGURE 8**

**Euler survey responses**



I noted above that conventional price equations (such as the one reported in Section 3) appear to have performed badly in recent years.

There is some suggestive evidence that an intensification of product market competition might have played some role.<sup>30</sup> For example, if we include the extent of import penetration in the conventional equation reported above, it is statistically significant ( $t = -1.99$ ). Further, the residuals are somewhat better-behaved and are no longer systematically negative at conventional levels of significance ( $t$ -statistic =  $-1.5$ ). It appears that the residuals from the above price equation are correlated to the “price discounting” response from the Euler survey referred to above – formally, a  $t$ -test over the 1993-2000 period yields a value of 2.9.<sup>31</sup>

Further, it is plausible that the price mark-up on marginal cost should be affected by the weakness of foreign competition as proxied by, say, the ratio of world export prices (in sterling terms) to the GDP deflator.<sup>32</sup> This ratio is significantly lower than it was in 1992, though the fall in recent years has occurred, in part, because of the rise in sterling’s exchange rate in 1996-97 (see Figure 9).

Work by Jennifer Greenslade of the External MPC Unit at the Bank of England on this issue suggests that world export prices are, indeed, an important, statistically significant, influence on domestic prices (the GDP deflator). Importantly, the residuals of the price equation are better-behaved in that, although they are, on average, still negative since 1998, this is no longer statistically significant ( $t = -0.38$ ). This represents a considerable advantage over the existing price equation, since there is less need to choose between alternative treatment of past residuals which, as we saw in Section 3 above, can lead to rather large differences in

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<sup>30</sup> Since the November 1999 Inflation Report, the majority of the MPC has, in fact, incorporated a “structural” compression of price-cost margins within the central projection. Even before that, it was an assumption made by a minority of the Committee that included me.

<sup>31</sup> If based on the contemporaneous value of price discounting in the Euler survey, or 3.9 if based on this measure lagged one period.

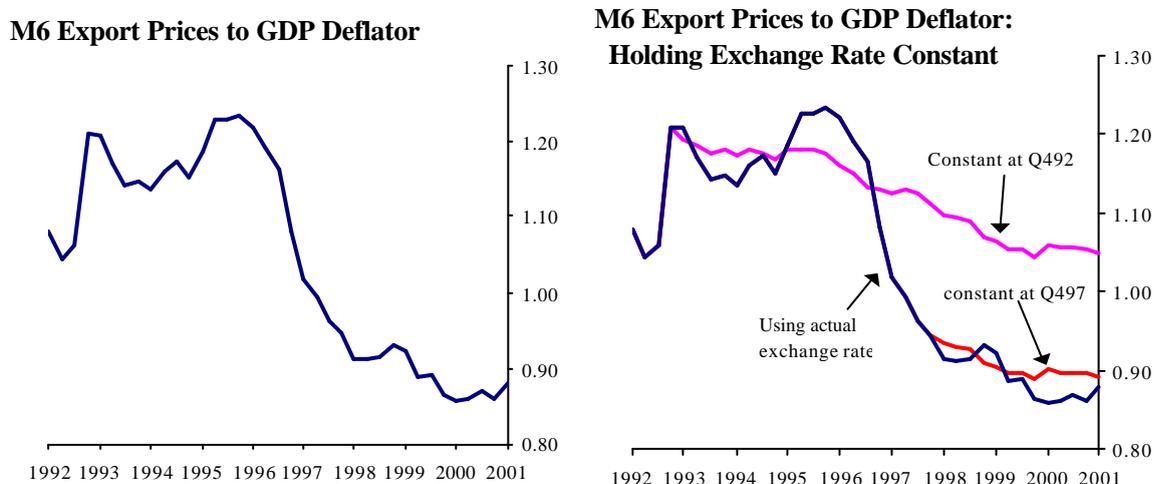
<sup>32</sup> For example, Martin (1997) shows that domestic prices may be a function of both domestic costs and overseas prices. In such a model, world export prices impact on domestic prices either through an effect on perfect substitutes or through a pricing-to-market effect for imperfectly substitutable traded goods (whereby world export prices influence domestic prices through the markup). In terms of such a model, he assumes that the elasticity of demand for these goods is a function of their relative prices. This may be rationalised in several ways, including the model of Froot and Klemperer (1989).

the resulting inflation forecast.<sup>33</sup> Note, incidentally, that if one believes that world export prices directly impact on domestic prices, then, in the current conjuncture, when the global economy is weakening significantly, thereby leading to lower world inflation, one is also likely to be more confident that UK inflation will remain low. Hence, using the alternative price equation can have a significant impact on one's inflation forecast at a time when the global economy is slowing.

Returning to the issue at hand, a NE sceptic might argue that the appearance of the residuals in the price equation are entirely due to the appreciation of the exchange rate and have nothing to do with the longer-term structural factors that might have led to an intensification of product market competition. I would not wish to deny that the persistence of sterling's 1996-97 appreciation has had an important disinflationary effect on UK prices. However, it is unlikely to be the only explanation.

First, not all of the recent fall in the ratio of export prices to domestic prices is directly attributable to the exchange rate. Indeed, Figure 9B shows that in a purely arithmetic sense, around one-third of the fall in the ratio since mid-1992 cannot be directly attributed to the exchange rate. Moreover, given that the exchange rate today is little different from where it was in 1997 Q4, the level of sterling cannot account for the continuing decline in relative world export prices since then.

### FIGURES 9A and 9B



<sup>33</sup> This is the reason why my personal projection for inflation was, in part, informed by simulations based on the alternative price equation.

Second, as already noted above, the Euler survey suggest that ‘price discounting’ and ‘competitive pressure’ have had a more significant impact on profitability than the exchange rate.

Third, some preliminary work suggests that in a general econometric price equation that includes sterling world export prices, the extent of import penetration might still play a statistically significant role.

Fourth, although the aforementioned econometric work includes world export prices denominated in sterling, some preliminary exploratory work suggests that in the short-run, changes in the prices of world exports denominated in local currencies have a much more significant impact on the price-cost mark-up in the UK than variations in the exchange rate. Of course, in the short-run, this would reflect rational behaviour if exchange rate changes were less persistent than changes in foreign prices. This deserves further investigation.

Fifth, as I have argued before (see Wadhvani (1999)), some of the re-rating of sterling (and the US dollar) versus the Euro may, in any case, have been because of the markets’ perception that NE forces were more important in the US and the UK than in continental Europe. Note, incidentally, that this perception may have arisen because of the pattern of forecast errors in the US and UK being different from elsewhere (as we saw in Section 2 above).

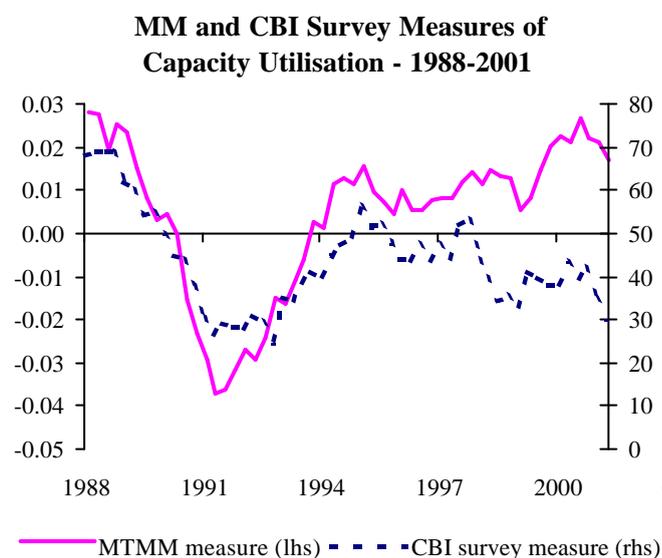
Of course, this issue deserves further research. Among other things, it is likely that there are some other factors which can explain the tendency to over-predict prices.

## **6.1 A DIGRESSION ON MEASUREMENT ERROR**

For example, it is possible that the measure of capacity utilisation that is currently used in the MTMM is misleading. Figure 10 compares the measure of capacity utilisation with a measure based on the CBI survey. Note that while the two measures

appeared to move reasonably closely together until about 1995, they have diverged since.<sup>34</sup>

**FIGURE 10**



It is possible that the MTMM measure of capacity utilisation is misleading because it uses an inappropriate measure of the capital stock. Current estimates of the capital stock are a so-called ‘wealth type measure’, where each item is weighted by the current asset price. While this is a valid measure for balance sheet purposes, it will be less appropriate for an assessment of productive potential, where one might want to compute a volume index of capital services (VICS, hereafter) instead. Note that in the VICS, each item of capital is, in principle, weighted by its contribution to output (ie its marginal revenue product) rather than its asset price. A consequence of using the VICS is that it increases the weight accorded to shorter-lived assets such as machinery, equipment and software, relative to buildings. If the stocks of shorter-lived assets (eg computers) are growing more rapidly than other types, then the VICS will, in turn, grow more rapidly than the wealth-based measure.

<sup>34</sup> The CBI measure used in Figure 10 is based on the Industrial Trends survey. We also produced a survey-based measure of capacity utilisation by combining different surveys (including the BCC survey on the services sector). The results were qualitatively similar to those in Figure 10.

Nicholas Oulton of the Bank of England has computed a preliminary measure of the VICS. Joint research with the ONS is ongoing on this issue. A preliminary VICS estimate has shown a rather higher growth rate in recent years, a period when we know that ICT investment accelerated (see Oulton (2001b)).

Of course, there is no straightforward link between the rate of growth of the capital stock and estimates of potential output because changing one's view of the appropriate capital stock will also affect one's estimate of what economists call total factor productivity (TFP, hereafter). Nick Davey and Jennifer Greenslade of the External MPC Unit at the Bank of England have examined these issues in the context of the MTMM. Because they use alternative capital stock data, various relationships have to be re-estimated. Their work is ongoing, but some interesting results from their pilot study include the possibility that the alternative capital stock data would have yielded a different picture for "capacity utilisation" in recent years - see Figure 11, which displays alternative proxy capacity utilisation series based on the wealth and the VICS measures, respectively.<sup>35</sup>

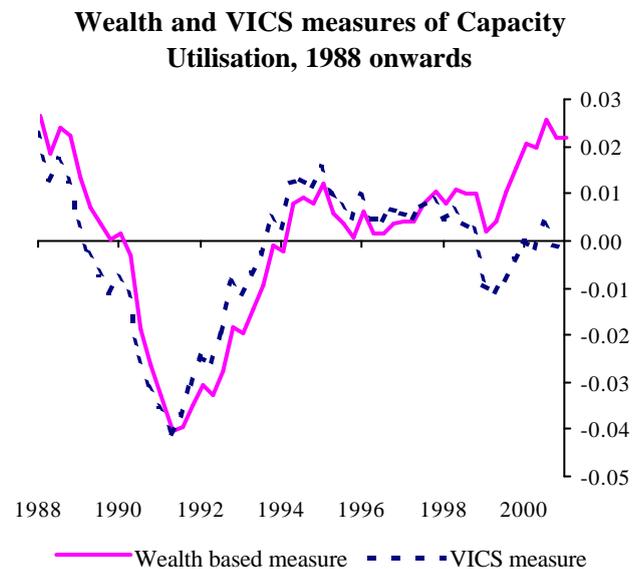
Although the two measures moved broadly in line between 1988-97, they have diverged since then, with the VICS-based measure exhibiting a greater degree of consistency with survey-based measures. Moreover, the gap between the two series has grown over time, so the measurement error might not be innocuous. Indeed, these two different views about the absence (or otherwise) of spare capacity can have an important effect on an assessment of the degree of inflationary pressure.<sup>36</sup> Further, it is interesting to note that including the VICS measure of the capital stock in the conventional price equation reported above improves the recent pattern of the residuals. Of course, this area deserves further research. Note that this is an area where it is important that our measurement conventions keep pace with the 'new economy' out there, and I look forward to the ONS' future work on this issue.

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<sup>35</sup> Note that data for 2000 are not yet available. In order to consider more recent events, it is assumed that the VICS estimate of the capital stock grows at around 1.6% p.a. faster than the wealth based measure in 2000. This is the average difference between the VICS and wealth based annual growth rates for the 1993-1999 period - note that this discrepancy is larger for example than the average over the whole sample (1979-1999), but smaller than the average since 1997.

<sup>36</sup> This is one reason why my personal projection for inflation was lower than the best collective projection published in the August 2001 Inflation Report.

**FIGURE 11**



To summarise, I have argued today that an intensification of product market competition for firms in the UK and mis-measuring changes in capacity utilisation have played a role in explaining why conventional price equations have tended to over-predict inflation. Some of the intensification of competition reflects secular factors, while some of it has almost certainly arisen from an “overvalued” exchange rate.

## **7 THE NE AND THE CURRENT CONJUNCTURE**

I have argued today that:

- (i) There is compelling evidence that the NAIRU fell significantly in the US and the UK over the 1992-2000 period. This was almost certainly attributable to, both, improvements in the workings of the labour market and an intensification of product market competition.

- (ii) Underlying productivity growth in the US accelerated after 1995 to a level that compares favourably with the 1973-95 period, though not a level which is high in relation to previous surges in productivity growth.

These are genuine advances, and are consistent with why I believe we have a NE. But, with internet-related stock prices down very significantly, and a global economic downturn, there has been much questioning of the NE. This, in part, is because the more extreme adherents of the NE made rather extravagant claims.

For example, in recent years, it had become increasingly fashionable to assert that recessions were a thing of the past. Now, it is true that output volatility has fallen in recent years (see, eg McConnell and Quiros (2000)). However, there are many causes of recessions which are unaffected by the NE. For example, the sharpness of the fall of business and consumer confidence in the US at the end of last year was a surprise. Chairman Greenspan reminds us that -

**“The unpredictable rending of confidence is one reason that recessions are so difficult to forecast. .... Our economic models have never been particularly successful in capturing a process driven in large part by non-rational behaviour.”**

Further, it is important to remind ourselves that significant volatility in share prices and the growth rate of corporate investment is not unusual around periods of rapid technological change. Indeed, historically, innovations often appear to have been associated with share price bubbles and over-investment in the innovating industry. The industry then appears to become overcrowded, and one then sees a period of bankruptcies and a significant cutback in investment. Whether or not this has significant macroeconomic effect depends, in part, on the policy response.

In their discussion of the 1882 Electrical “Mania”, Kennedy and Delargy (1997) calculate that the average share price of their sample of quoted electrical companies fell by around 93% between the peak in 1882 Q3 and trough in 1884 Q4! The fluctuations in the stock market affected the ability of the electrical industry to raise money, and thereby develop. Kennedy and Delargy (1997) point out that while the prospective electrical supply undertakings raised over £2mn at the height of the mania

in 1882 alone, they were only able to raise around £235,000 in the subsequent five year period. Share price volatility almost certainly affected the time-path of investment in electrical undertakings. However, it did not stop us from reaping the benefits of electricity eventually.

Similarly, Baines, Crafts and Leunig (2001) discuss the railway mania of 1844-7, and point out that “there was huge speculation in railway shares followed by a spectacular crash in 1845 even in the shares of those companies that would become giants of the industry in later decades”. Indeed, notwithstanding the crash of 1845, railway mileage rose from about 2,000 miles of track in 1844 to nearly 14,000 miles by 1870. The authors argue that the railways made a growth contribution of about 0.25 per cent a year during 1840-70.

Interestingly, a similar boom-bust phenomenon in the innovating industry was also associated with motor vehicles, radio and airline industry (see Meyer (2001) for a discussion of these examples).

I do not wish to imply that it will be plain sailing in the near-term. The underinvestment in the British electrical industry following the share price crash in 1882-84 is widely regarded to have significantly slowed the pace at which Britain took advantage of the new innovation.

More generally, recessions or growth recessions that follow the bursting of speculative bubbles and which are associated with the elimination of investment overhangs have historically tended to be longer-lived than those recessions that have been associated with inflation-fighting by the central bank. Currently, the degree of excess capacity in the global telecoms industry is very high. Weak corporate investment and a significant drying-up of venture capital finance suggest that it might be some time before the US economy recovers convincingly, especially as the current level of share prices appears to be predicated on an implausibly sharp rebound in profits in 2002. A further fall in the US stock market would make consensus forecasts of a significant recovery in GDP growth in the next few months even less plausible.

Were the economy to remain weak, this might lead corporate investment to be even weaker, which would lower labour productivity growth further. This might, in turn, lead investors to reassess the level of equity prices – so, as I have argued before (see Wadhvani (2001)) a self-reinforcing, vicious cycle remains a downside risk.

Equally, though, it seems premature to be excessively gloomy about the potential, long-term productivity benefits of ICT, and the Internet in particular. Specifically, in reporting on a study of eight sectors which collectively account for about 70 per cent of US GDP, Litan and Rivlin (2001) argue that “the potential of the Internet to enhance productivity growth over the next few years is real”. De Long and Summers (2001) argue that if the rate of technological progress in the ICT sector remains high,<sup>37</sup> then economy- wide productivity growth is also likely to resume a healthy rate of growth because the ICT sector is likely to become an increasingly important part of the economy. This is partially attributable to the likelihood that the income elasticity of demand for ICT products is greater than one, so, as we grow richer, the share of ICT expenditure in total expenditure will grow. Whether or not this potential is realised will, though, partly depend on the macroeconomic environment.

It behoves us to recall that, in recent US economic history, a period of rapid productivity growth (the 1920s), was followed by the Great Depression in the 1930s. Much therefore depends in macroeconomic policy being appropriate.

To summarise, it seems to me that the NAIRU did fall in the UK and the US and that the underlying trend growth of productivity did accelerate in the US. In that sense, we do have a ‘new economy’. However, this is not an economy where the business cycle is dead thereby justifying sky-high equity valuations. The global economy probably has a difficult period ahead of it in the near future, but this does not diminish the fact that some gains have been made.

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<sup>37</sup> There are many scientists who believe that this will be true over the next decade.

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