ECONOMIC PAPERS

Number 140 February 2000

Disentangling Trend and Cycle in the EUR-11 Unemployment Series

An Unobserved Component Modelling Approach

by

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ECFIN/27/2000-EN This paper exists in English only.

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An Unobserved Component Modelling Approach

Abstract

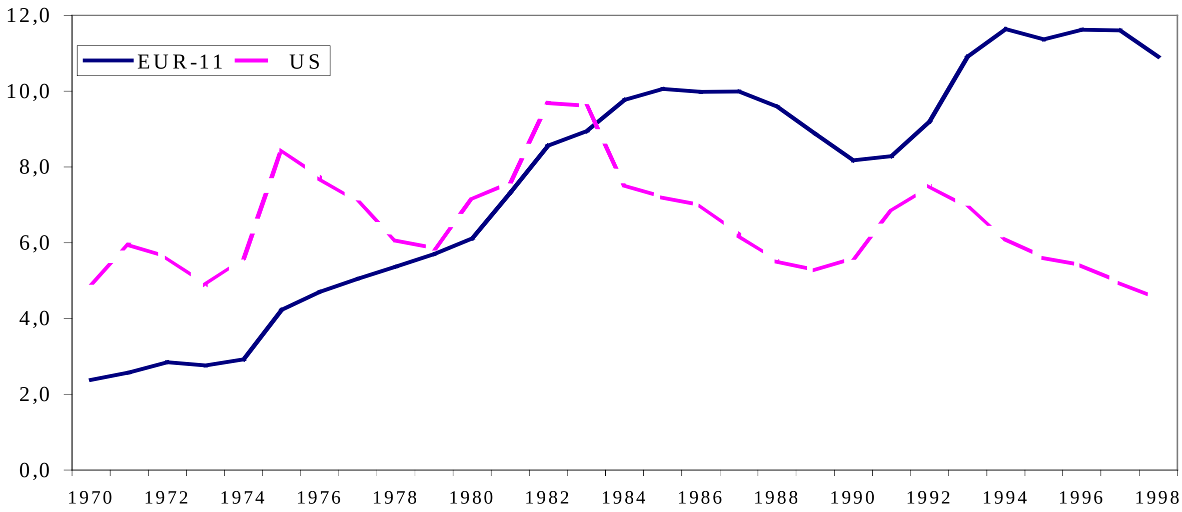
A variety of statistical methods and econometric techniques can be used attempting to disentangle the non-cyclical trend component of a time series and its purely cyclical part. This note serves the purpose to demonstrate the potential contribution from the use of unobserved components modelling techniques to decompose the EUR-11 unemployment series. In general, unobserved components models appear to be an attractive and quite flexible tool to discriminate between the cyclical and the trend component in unemployment; in particular, the multivariate version of the model allows to use information contained in the price series to assist the decomposition of the unemployment rate. Consequently, this specification is potentially closer to the NAIRU concept than univariate filtering techniques.

The results of our analysis indicate that attempts to use combined information on inflation and unemployment to extract the cyclical component in unemployment may indeed be worth pursuing. In particular, the multivariate model produces a fundamentally different evolution for the slope of trend unemployment in the euro area than univariate specifications. Euro area unemployment has been estimated running close to its trend value at the turn of the century. The empirical results also suggest that a one percentage point unemployment gap has been matched by a cyclical variation in inflation of -1.3 %.

1. INTRODUCTION

European labour markets overall have performed very poorly over the past 25 years. Figure 1 shows the evolution of unemployment in the European Union since the 1970s, exhibiting the strong trend increase in the unemployment rate in the area as a whole. Starting from an average value of close to 2 per cent in the Sixties, in the aftermath of the first oil price shock European unemployment had been steadily rising throughout the 1970s and the first half of the 1980s; and although it fell to around 8 per cent in the ensuing boom period until the beginning of the 1990s, the rate of unemployment failed by far to return to pre-shock levels. As a consequence, the economic turbulences in the first half of the 1990s saw European unemployment ratcheting up from an already high starting value to a peak of 11 per cent in 1994. Despite some improvement in recent years, the rate of unemployment in the European Union still runs at almost double-digit figures at the end of the decade, with the average number of unemployed persons amounting to a staggering 16 million.

Figure 1 - The evolution of unemployment rates (1970-98)

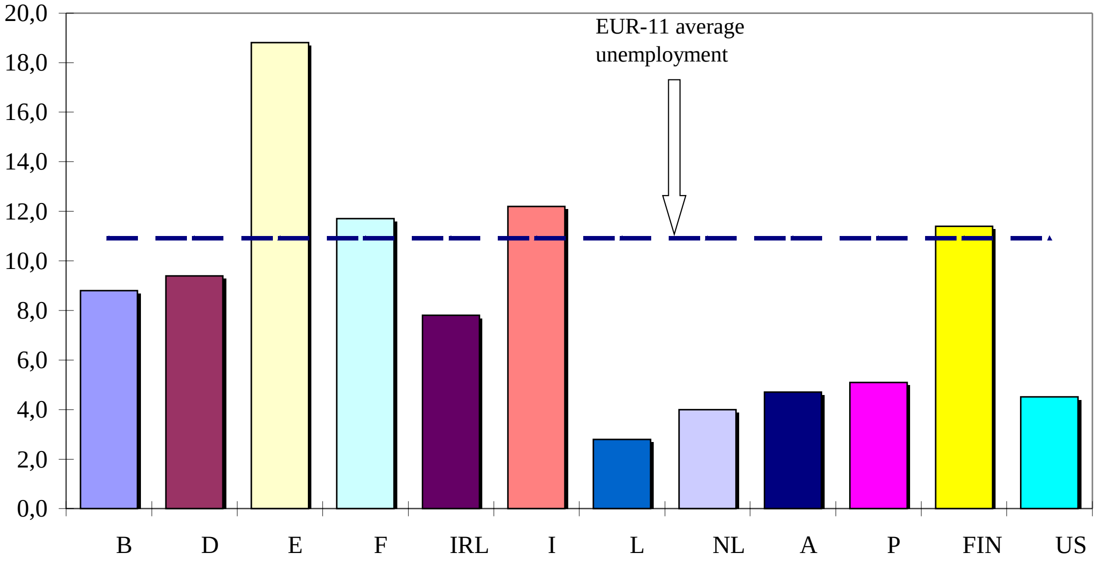


Source: Commission Services (AMECO Database)

Clearly, the general picture masks important differences between individual countries as suggested by the considerable dispersion of country level employment and unemployment rates in the European Union. Figure 2 shows the large dispersion in unemployment rates across countries, from 3-5% in Luxembourg, the Netherlands, Austria, Portugal and Denmark, to 9-12% in Germany, France and Italy, and to almost 19% in Spain in 1998. The figure also indicates that a number of countries have succeeded in the task of bringing down unemployment significantly over the past decade or maintaining relatively low levels, while some others have failed so far.

Conventional macroeconomic thinking suggests a conceptual distinction between structural and cyclical unemployment. The cyclical component represents a synthetic view of the impact of short-run demand shocks, while the non-cyclical or trend component (frequently defined as the rate of unemployment at which no upwards or downwards pressures on inflation arise from the labour market) is determined by a set of microeconomic structural factors affecting the demand and the supply side of the labour market. Thus, high observed unemployment at any given moment in time may be attributed either to unfavourable structural features of the economy or to the negative impact of a temporary 'cyclical' shock.

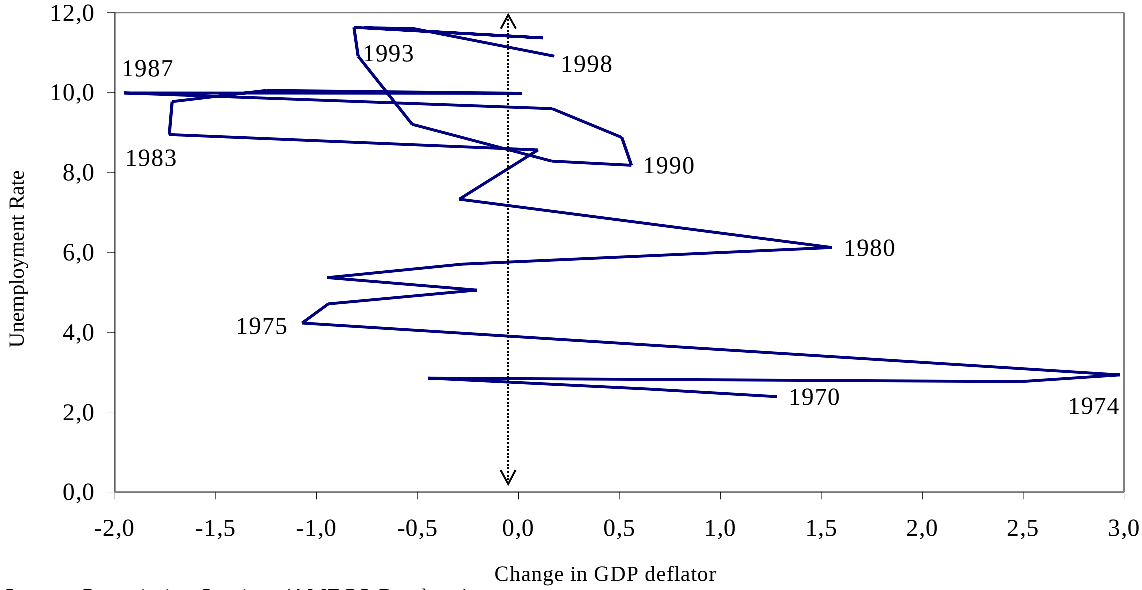
Figure 2 - Dispersion in unemployment rates in 1998



Source: Eurostat

However, this clear-cut distinction gets blurred by the interaction between shocks and institutional propagation mechanisms resulting in the persistence of unemployment. Furthermore, since the notion of structural unemployment is a theoretical construct and as such, by definition, not directly observable, empirical estimation is bound to remain a controversial issue. Nevertheless, there seems to be a fairly broad consensus that the bulk of current unemployment in Europe is of a non-cyclical nature.

Figure 3 - Phillips-Relation in the Euro-area



Source: Commission Services (AMECO Database)

Indeed, if high unemployment were simply the result of persistent aggregate demand deficiency, one would expect to see both a sustained downward movement in prices (the Phillips-curve relation) and a sustained low degree of capacity utilisation (the Okun-curve relation). However, rough inspection of the data in Figure 3 indicates that when the disinflation process in the 1980s came to halt, Euro area unemployment had failed by far to return to its former level; similarly, the rate of unemployment associated with an output level corresponding to potential appears to have almost doubled. Both developments strongly suggest that equilibrium unemployment has risen significantly in the course of the 1970s and 1980s. For the period thereafter, it is much harder to infer an apparent trend in equilibrium unemployment. Thus, over the period 1989-1998 the movement of unemployment may well be characterised as cyclical swings around a more or less constant and high structural rate.

This general impression derived from a rough visual inspection of the relevant data tends to be validated, by and large, by more sophisticated analysis. One statistical approach to disentangle trend and cycle is to estimate an unobserved component time series model. The remainder of the paper is devoted to an analysis along these lines.

2. THE UNOBSERVED COMPONENT MODEL

This note describes a decomposition of the EUR-11 aggregate unemployment rate series into trend and cycle, as obtained through the use of Unobserved Components (UC) modelling techniques. In this section, we present the methodological framework. The UC method assumes that macroeconomic time series are actually composed of distinguishable trend, cyclical and erratic components[1], which are not directly observable. If the aim is to decompose an individual time series, such as the unemployment rate, into trend and cycle (plus an erratic component) within a univariate framework, i. e. by only using time series information from the unemployment rate, then these components can be recovered from the actual observations by imposing sufficient restrictions on the trend and cycle. This essentially requires assumptions on the functional form of these components and the structure of the error processes, including cross correlation properties. A multivariate extension of this approach is also possible. This allows to use other empirical information, for example information from inflation to assist the decomposition. The multivariate framework thus allows to use more economic information for identifying a trend and a cycle in the unemployment rate.

The main part of this section provides a more formal description of the basic ingredients of the univariate and multivariate UC-modelling approach.

[1] The possibility to include a seasonal component also exists and it has been shown that it should be considered as a first best approach (see, for example Maravall (1996)). In other words, it is preferable to use seasonally unadjusted series and incorporate a seasonal component as part of the model. Unfortunately, such series are not always available. In the case of the present work, seasonally adjusted series have been used.

2.1. Univariate Unobserved Component Models

A typical macroeconomic series, such as the unemployment rate (U_t) in our case, is assumed to be additively composed of a trend component, T_t, a cyclical component c_t and an erratic component ε_t as follows:

$$U_t = T_t + c_t + \varepsilon_t \qquad \varepsilon_t \sim NID(0,\sigma_\varepsilon^t) \qquad t = 1,...,T \tag{1a}$$

In the literature, the components are still nearly exclusively modelled as linear stochastic processes. The irregular component ε_t is simply a white noise. The trend component can be, for instance, a damped AR(1) but the local linear specification described below is more common:

$$\begin{aligned} T_t &= T_{t-1} + \beta_{t-1} + \eta_t \qquad & \eta_t \sim NID(0,\sigma_\eta^2) \\ \beta_t &= \beta_{t-1} + \xi_t \qquad & \xi_t \sim NID(0,\sigma_\xi^2) \end{aligned} \tag{1b}$$

where β_t is the slope and u_t is the level.

The above formulation for the trend has the advantage of being very general. A deterministic trend is obtained by removing the error term from both equations. More complex trend specifications can also be derived as a by-product of this system:

The random walk plus drift, if σ_ξ^2 turns out (or is fixed) to be equal to zero

Smooth trend, if σ_η^2 turns out (or is fixed) to be equal to zero

The Hodrick-Prescott trend, if σ_η^2 turns out (or is fixed) to be equal to zero and $\dfrac{\sigma_\xi^2}{\sigma_\varepsilon^2} = 0.000625$.

The cyclical component c_t is an AR(2). More formally, the following specification is used:

$$\begin{pmatrix} c_t \\ c_t^* \end{pmatrix} = \rho \begin{pmatrix} \cos\lambda_c & \sin\lambda_c \\ -\sin\lambda_c & \cos\lambda_c \end{pmatrix} \times \begin{pmatrix} c_{t-1} \\ c_{t-1}^* \end{pmatrix} + \begin{pmatrix} k_t \\ k_t^* \end{pmatrix} \tag{2a}$$

where k_t and k_t^* are uncorrelated and both $\sim NID(0,\sigma_k^2)$; λ_c is the frequency of the cycle in radians[2]. After some manipulation it can be seen that this trigonometric formulation of the cyclical component is equivalent to the more familiar AR(2) specification with coefficients that restrict this process to be cyclical

$$c_t = (2\rho\cos\lambda_c)c_{t-1} - \rho^2 c_{t-2} + \varsigma_t \tag{2b}$$

[2] The period of the cycle is : $2\pi / \lambda_c$.

where $\varsigma_t = (1-\rho\cos\lambda_c L)k_t - (\rho\sin\lambda_c L)k_t^*$ and L is the lag operator

Finally, in order to achieve identification of the overall model, it is usually assumed that the components are uncorrelated with each other. Estimation of these dynamic UC-models can be performed using the Kalman filter approach. This requires setting some initial values for the parameters and reformulating the model in State-Space Format.

The above framework can be extended in many ways. For instance, it is possible to specify a model containing both UC and observable components such as explanatory variables and to perform intervention analysis. Finally, the most general specification is the multivariate UC-model which can be obtained as a straightforward extension of the univariate case. A particularly interesting feature of multivariate models is the option to impose the existence of common components. Although UC-models may be used in a fairly mechanic way, it is clear that the flexibility of the method enables more tailored analysis. Such a framework, as we will see below, opens up the possibility to allow for economic content to guide the setting up of the system.

2.2. Multivariate Extension of the UC-Model

In the univariate unobserved components model, the decomposition of unemployment into trend and cycle (and possibly an irregular component) is based on purely statistical criteria, no further economic information is used in the identification process. The multivariable extension of the model is derived by specifying additional measurement equations. In general, the latter contain hypotheses on the relationship between the (unobserved) cycle and other (observed) variables which economic reasoning suggests to be highly cyclical. One such variable is the change of the inflation rate (π_t), since many Phillips curve type models relate deviations of actual structural unemployment to explain changes in inflation. This information can be used by introducing an additional measurement equation to the system. In this study the following inflation equation is added

$$\Delta\pi_t = \sum \alpha_i \Delta\pi_{t-i} + \gamma c_t + u_t \tag{3}$$

i. e. it is assumed that the cyclical component (c_t) helps in improving the fit of a simple AR specification for the change in inflation. Exploiting the dependence of unemployment and inflation on a common (unobserved) unemployment gap by jointly estimating the coefficients of the cyclical component (equation 2a or 2b) and the parameter γ in the inflation equation should provide more information on the unemployment gap than just estimating equation (1) and (2) together with the trend specification.

It must, however, also be stressed that the advantage of adding an additional equation rests crucially on a correct specification of the additional measurement equation. Within a maximum likelihood context a possible misspecification of the inflation equation could lead to biased estimates of the parameters of the cyclical component itself.

3. THE RESULTS

In this section, we present the estimation of univariate and multivariate UC-models for the EUR-11 unemployment rate over the period 1960-98, using annual data.

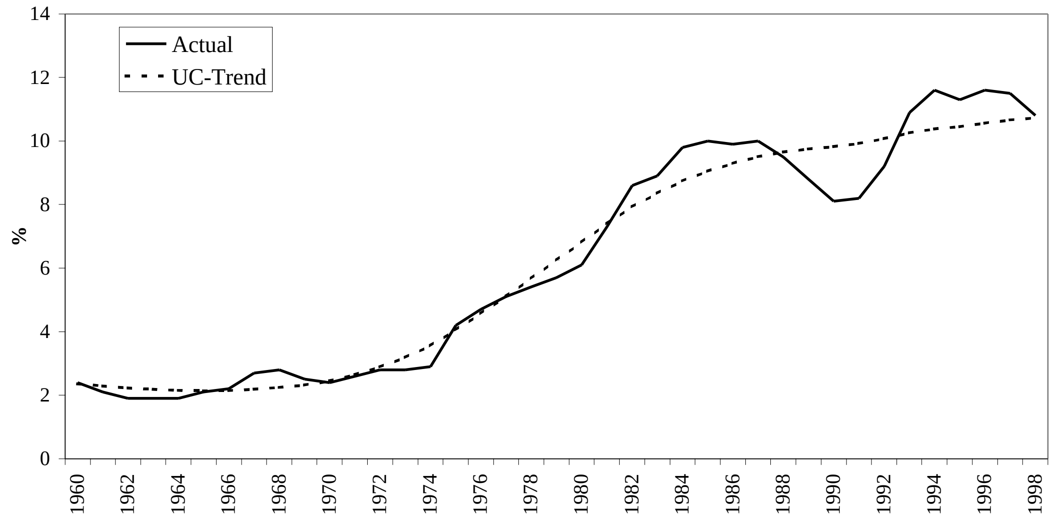
3.1. The Univariate Case

For the univariate UC-Model, although the estimation is based on the general specification described above, the results produced a more specific model. That is, the estimated model contains no erratic component and a smooth trend has been selected (i.e.: $\sigma_\eta^2 = 0$). In other words, the univariate model (1) has been scaled down, through the estimation process, to the following model

$$
\begin{aligned}
U_t &= T_t + c_t \\
T_t &= T_{t-1} + \beta_{t-1} \\
\beta_t &= \beta_{t-1} + \xi_t \qquad\qquad \xi_t \sim NID(0, \sigma_\xi^2)
\end{aligned}
$$

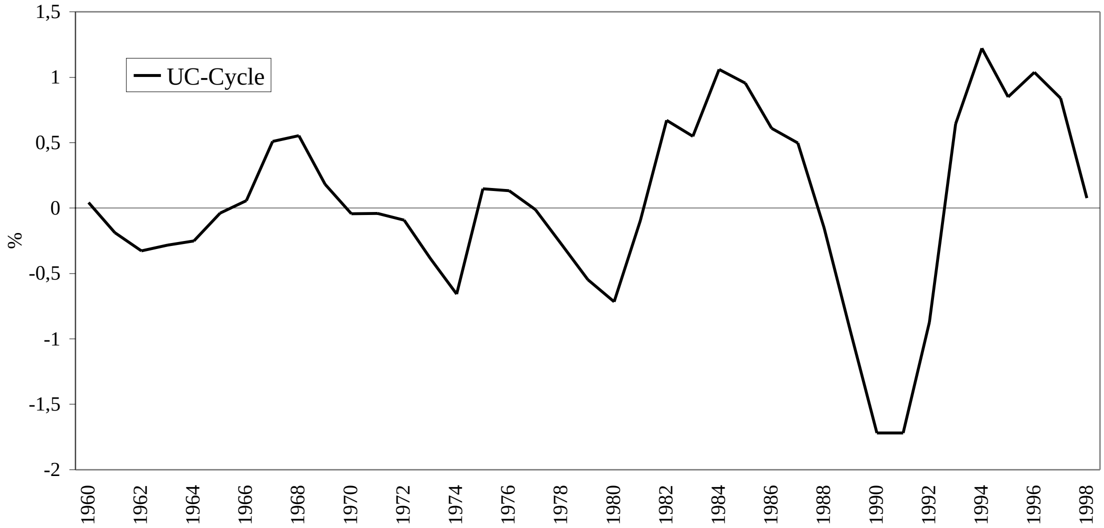
The resulting values for the estimated trend level of EUR-11 unemployment are depicted in Figure 4. The cycle (or equivalently the unemployment gap) has a standard deviation of 0.74, an amplitude of 1.04 and a period length of 11.2 years. However, the cycle is a stochastic process and, thus, the latter parameters may fluctuate over time. Indeed, Figure 5 suggests, that since the mid-80s the amplitude and the length of the cycle have increased.

Figure 4 - Univariate UC-Model
EUR-11 Unemployment Rate



Source: Commission Services (AMECO Database)

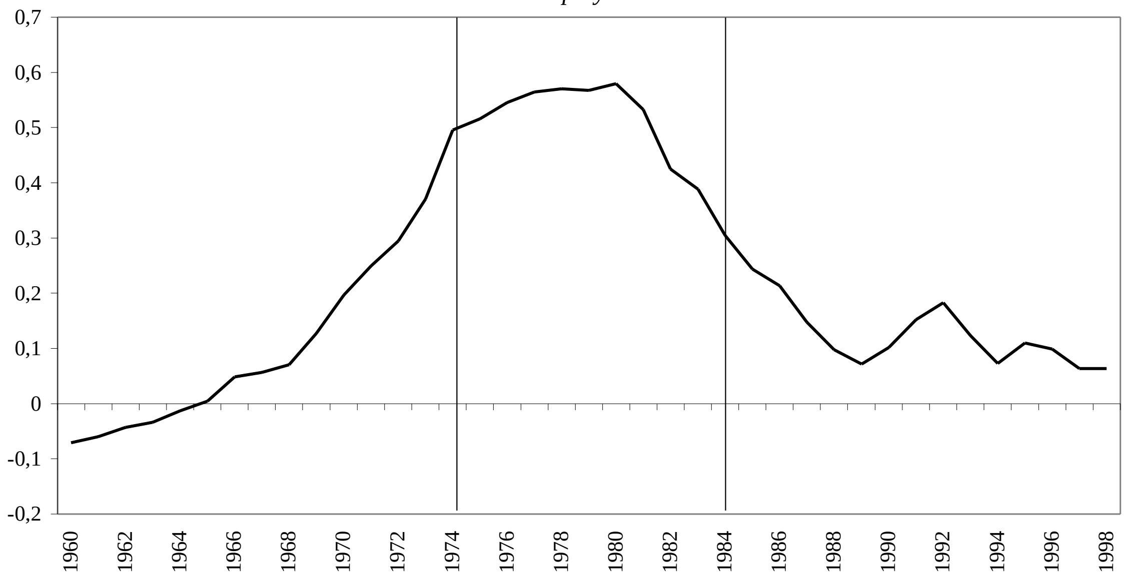
Figure 5 - Univariate UC-Model
EUR-11 Unemployment Rate



Source: Commission Services (AMECO Database)

The plot of the actual unemployment rate series suggests that there might be three different sub-periods for the slope : 1960-74, 1975-1984 and 1984-98. The first and the last sub-period seem to have quite similar slopes. This, somehow, corresponds to the evolution of the estimated slope (see Figure 6 below). On the other hand, the estimated trend does not distinguish the three sub-periods in a clear cut manner. Rather, it smoothens the evolution of the slope throughout the period. This is a well known feature of such smooth processes. In the case at hand, it may not be an adequate approximation and, consequently, it may blur the results, particularly around periods of changing slope (i.e.: 1974 and 1984). In the annex, we illustrate this point using an alternative specification for the slope, which allows for two structural breaks.

Figure 6 - Slope of the Trend in the Univariate UC-Model
EUR-11 Unemployment Rate



Source: Commission Services (AMECO Database)

In order to infer the quality of our results, we use the well known Hodrick-Prescott output gap[3] figures as a benchmark. The correlation between the HP output gap and our unemployment gap series is strong: -0.82. Furthermore, in order to obtain comparable indicators, we estimate a UC-model for the output gap. The UC-model for the output gap turned out to be solely composed of a cyclical component. In addition, the cycle for the HP output gap is very similar to the one contained in the unemployment series. In particular, the period length of the cycle for the output gap, 11.5 years, is very close the one obtained for the unemployment rate cycle (11.2). Interestingly, this suggest that aggregating the countries does not produce a cycle with an average period length. Rather, it tends to increase the length of the cycle as the aggregate cycle has a period bigger than any of its country-specific counter part[4].

Finally, we use the so-called Okun's law, formalised below, to relate more explicitly our unemployment gap measure to the HP output gap.

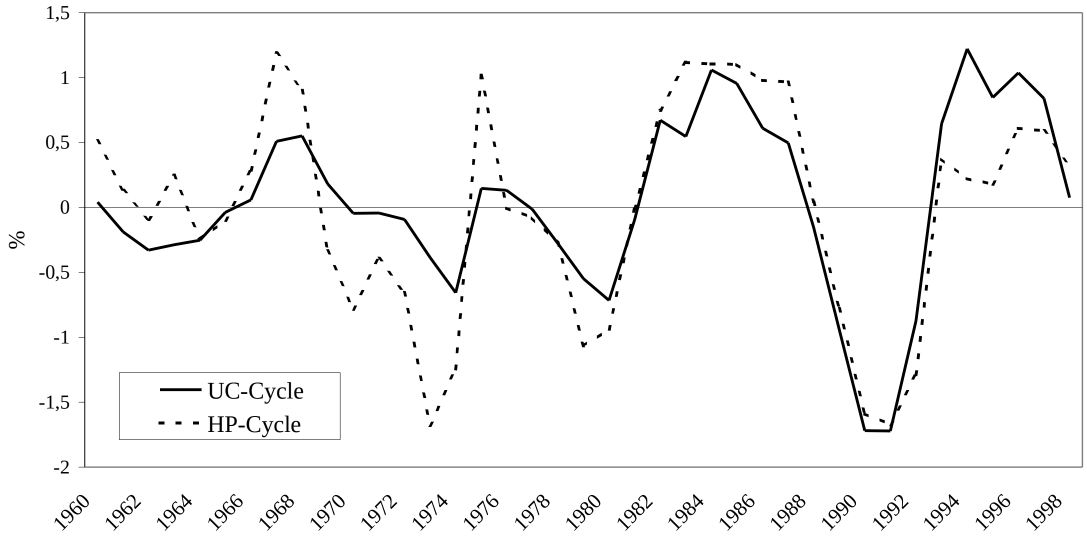
$$\frac{(y-y^*)}{y^*}\times 100 = -\alpha \times (U-U^*)$$

where output, potential output, the unemployment rate and the structural rate of unemployment are respectively denoted by: y, y^*, U and U^*.

Plugging in the gathered information on the unemployment and the output gaps, we estimated the above relationship and obtained a value of $\alpha = 1.8$.

Fixing α to its estimated value, 1.8, we then used Okun's law to compute an unemployment gap based on the HP output gaps. Figure 7 below compares the latter to our UC unemployment gap.

Figure 7 - Comparison of two Unemp. Gap : of the UC and the HP (with Okun's law)
EUR-11 Unemployment Rate



Source: Commission Services (AMECO Database)

[3] European Commission Services figures have been used, which set $\lambda = 100$ for annual data and account for the end-point problem by extending the length of the actual series through projection techniques.

Although the two estimates display a strong degree of co-movement, their relative amplitude is unstable. In particular, at the beginning of the period the UC unemployment cycle is generally smaller than the HP unemployment cycle, with a tendency for this situation to reverse over time.

A straightforward interpretation of this finding is that the Okun-coefficient is unstable over time. More precisely, Figure 7 suggests that the value of α has a tendency to decrease over the estimation period[5]. This tends to be confirmed, by the results of estimating Okun's law on a set of different sub-periods (Table 1).

Table 1 Estimates of Okun's Law

Sub-Periods	α	t-stat	R^2
1960-98	1.8	8.9	0.67
1960-80	3.1	5.6	0.59
1981-98	1.6	8.9	0.81
1960-70	2.2	2.6	0.35
1971-80	3.6	5.1	0.60
1981-90	1.9	10.1	0.90
1991-98	1.3	4.6	0.75

In particular, the above figures suggest that the value $\alpha = 1.8$ suits best the 80s. Also, the evolution for α is not perfectly monotonic as the result for the first decade is closer to the 90s than to the 70s. This was also the case for the evolution of the slope. Still, these are rough estimates and the primary objective here is rather to compare our unemployment gap to the HP figures. Overall, it seems that the correspondence between the two measures is strong, especially when allowing for a time-varying Okun's law.

3.2. The Multivariate Case

The multivariate UC-model allows to use the information contained in the price series to assist the decomposition of the unemployment rate. Consequently, this specification is potentially closer to the NAIRU concept. Indeed, theory suggests that the unemployment gap should be defined as the cyclical component which is present both in the price and the unemployment series. The multivariate UC-models conveniently allow for such cross-equation relationships among the UC. Moreover, in the case of the cyclical component, it is possible to control for two different degrees of co-movement, i.e.: the

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[4] In Orlandi and Roeger (1999), some preliminary work at the country level for EU-15 obtained periods ranging from 3 to 10 years and averaging to 4.56 years.

[5] A similar result pointing to an increase of the cyclical volatility of unemployment in response to output fluctuations has been obtained by Pichelmann (1999).

similar cycles hypothesis and the common cycles hypothesis. The latter impose perfect (positive or negative) correlation between the two cycles[6], whereas the former only imposes similar parameters on the two cycles, i.e. the frequency (λ_c) and the degree of stationarity (ρ). In this section, we shall investigate both the similar and the common cycle assumption.

The similar cycle case

$$U_t = T_{1t} + c_t$$
$$\Delta\pi_t = \beta_1 \cdot \Delta\pi_{t-1} + \beta_2 \cdot \Delta\pi_{t-2} + T_{2t} + c_t^{'} + \varepsilon_{2t}$$
$$T_{1t} = T_{1t-1} + \beta_{1t-1} \quad \text{and} \quad \beta_{1t} = \beta_{1t-1} + \xi_{1t} \quad \text{with} \quad \xi_{1t} \sim NID(0, \sigma_{1\xi}^2)$$
$$T_{2t} = T_{2t-1} + \beta_{2t-1} \quad \text{and} \quad \beta_{2t} = \beta_{2t-1}$$

where c_t and $c_t^{'}$ are similar cycles.

The common cycle case

$$U_t = T_{1t} + c_t + \varepsilon_{1t}$$
$$\Delta\pi_t = \beta_1 \Delta\pi_{t-1} + \beta_2 \Delta\pi_{t-2} + T_{2t} + \gamma c_t + \varepsilon_{2t}$$
$$T_{1t} = T_{1t-1} + \beta_{1t-1} \quad \text{and} \quad \beta_{1t} = \beta_{1t-1} + \xi_{1t} \quad \text{with} \quad \xi_{1t} \sim NID(0, \sigma_{1\xi}^2)$$
$$T_{2t} = T_{2t-1} + \beta_{2t-1} \quad \text{and} \quad \beta_{2t} = \beta_{2t-1}$$

where the two cycles are identical up to a factor.

The most general specification has been used for the estimation[7]. However, the estimation produced a more specific model. Note that in the similar cycle case, an erratic component is still not required. As a matter of fact, the above specifications are very close to the one obtained for the univariate case. The general local linear trend has, again, been scaled down to the smooth trend specification. Through the estimation process, the similar and the common cycle specification have converged to the same decomposition for the cyclical component, namely a common cycle with perfect negative correlation and a period length of 13.5 years. Note that the information contained in the price equation tends to increase the length of the cycle some more. The Figures below present the multivariate decomposition for the common cycle hypothesis and compare it to the univariate case. We observe a substantial difference between the two different decompositions. In particular, the multivariate model produces a fundamentally different evolution for the slope of the unemployment rate.

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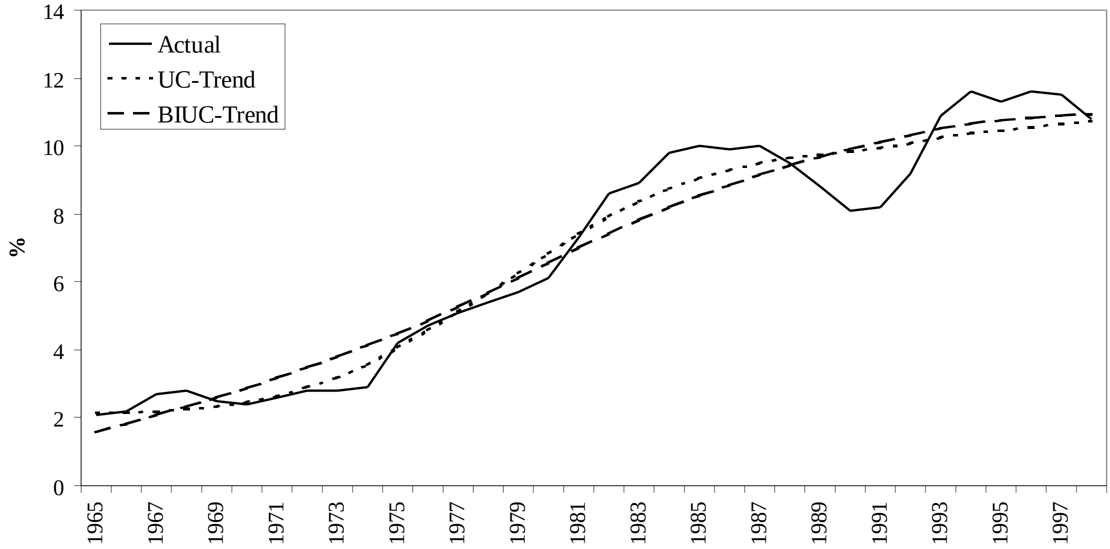
[6] Also known as the Common Features Cycles hypothesis, as introduced by Engle and Kozicki (1993).

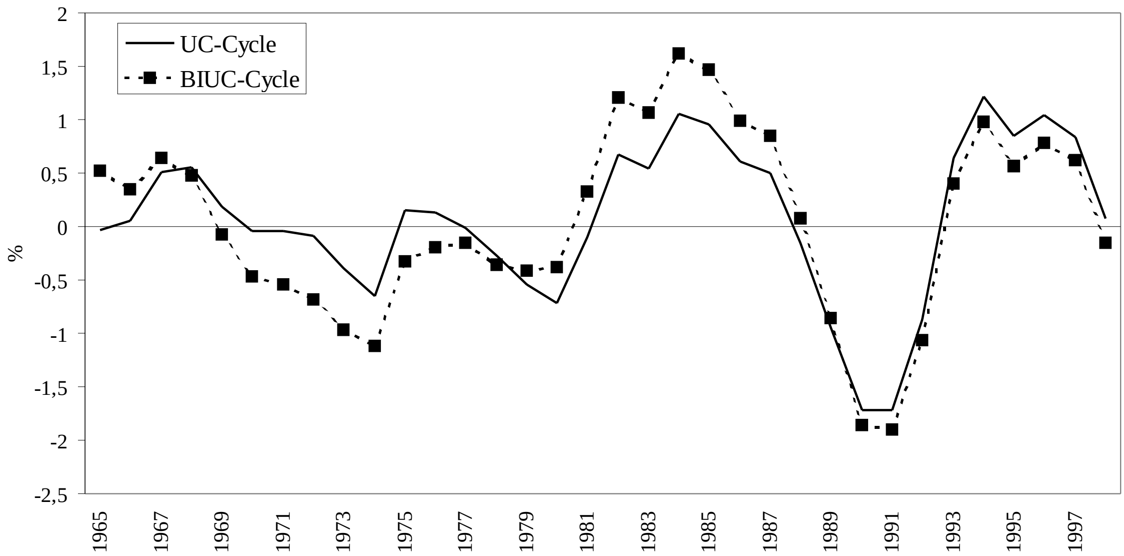
[7] Furthermore, we allow for the presence of a linear trend in the price equation.

Figure 8 - Univariate (UC) and Bivariate (BIUC) UC-Model
EUR-11 Unemployment Rate



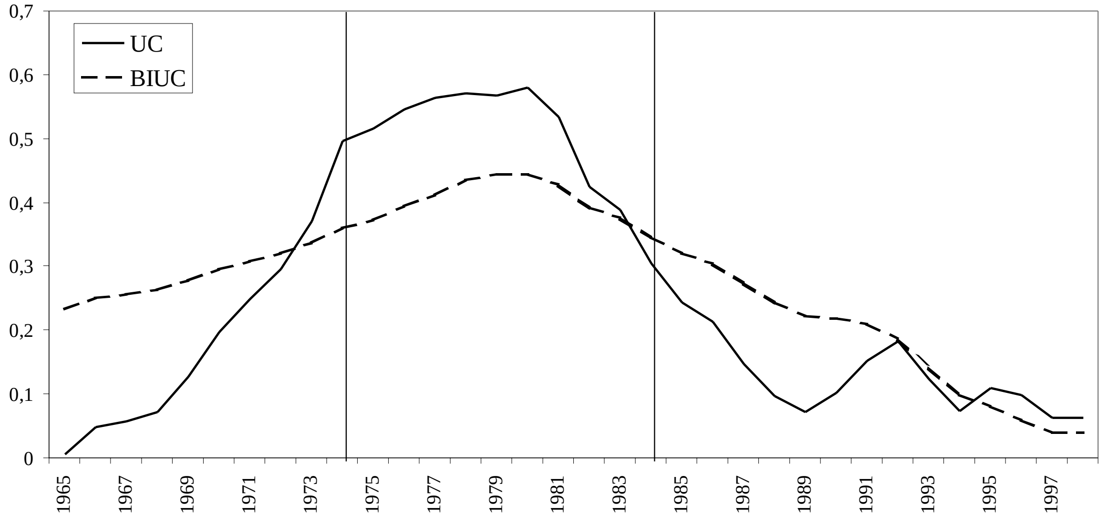
Source: Commission Services (AMECO Database)

Figure 9 - Univariate (UC) and Bivariate (BIUC) UC-Model
EUR-11 Unemployment Rate



Source: Commission Services (AMECO Database)

Figure 10 - Slope of the Trend in the UC-Model and BIUC-Model
EUR-11 Unemployment Rate



Source: Commission Services (AMECO Database)

Furthermore, the results show (see Table 2 below) that the common cycle is significant in the price equation. These results also suggest that a 1% unemployment gap is matched by a cyclical variation of inflation of -1.3%.

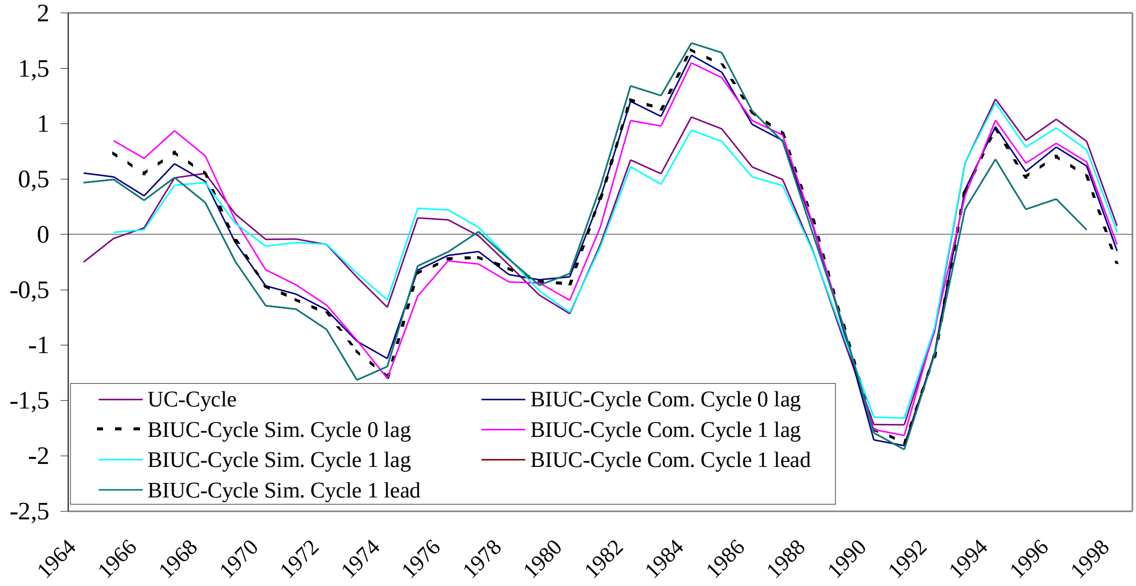
Table 2 **Description of the price measurement equation**
Dependent variable : Variation of Inflation

Independent variables	1st AR term	2nd AR term	Common Cycle	Linear Trend	1991 dummy
Coefficient	-0.06	1.05	-1.30	-0.08	-0.18
T-stat	-4.75	0.96	-5.08	-0.69	-1.40
R^2	0.54				

3.3. Some further analysis

Some sensitivity analysis has been performed to investigate the impact of shifting the price equation by one lag or one lead. Basically, the results confirm our previous decomposition (see Figure 11 below). Yet, it seems that the information contained in the price equation cannot be internalised anymore when we lag the price equation and use a similar cycle specification. Indeed, the cycle produced in that case is essentially the univariate one. On the other hand, the specification which leads the price equation by one period appears to provide the most adequate setting to exploit the information contained in the price series, i.e. these models are the one that depart most from the univariate case.

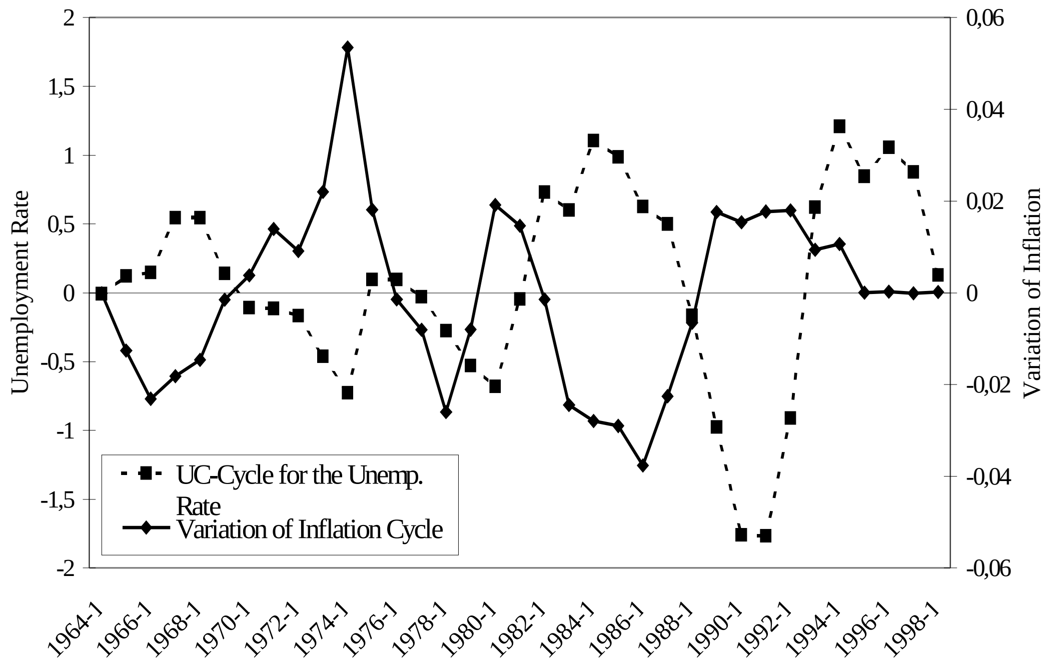
Figure 11 - Some sensitivity analysis (Shifting the Price equation)
EUR-11 Unemployment Rate



Source: Commission Services (AMECO Database)

Finally, in order to put our multivariate cycle in context with some rough information concerning the common cyclical evolution of inflation and unemployment, we present estimates of univariate UC-cycles for the unemployment and the price series (Figure 12).

Figure 12 - Cycles in the Unemployment Rate and the variation of Inflation
Univariate UC-Models

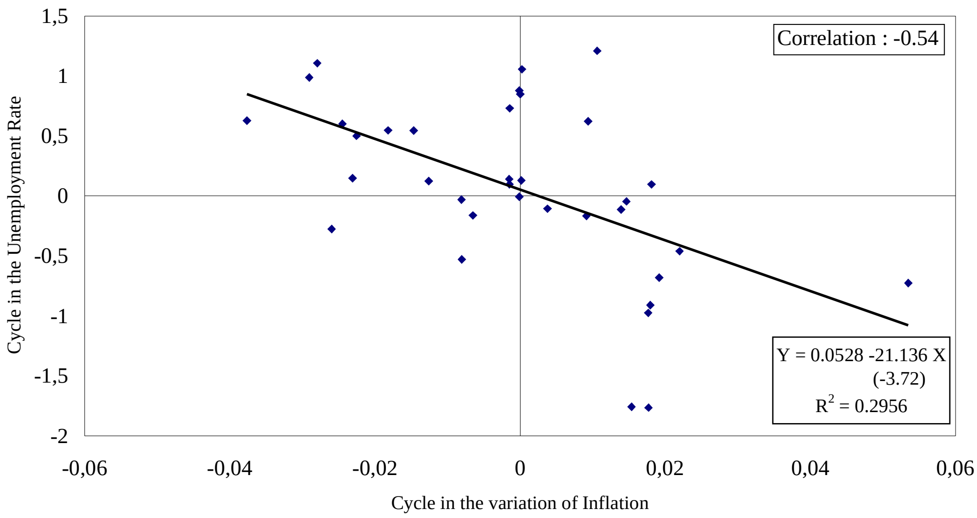


Source: Commission Services (AMECO Database)

First of all, it may be interesting to note the close resemblance between the two univariate cycles (Figure 13). Thus, it can be argued that the unemployment series does already contain a fair amount of information concerning the common cycle to which the theory refers to.

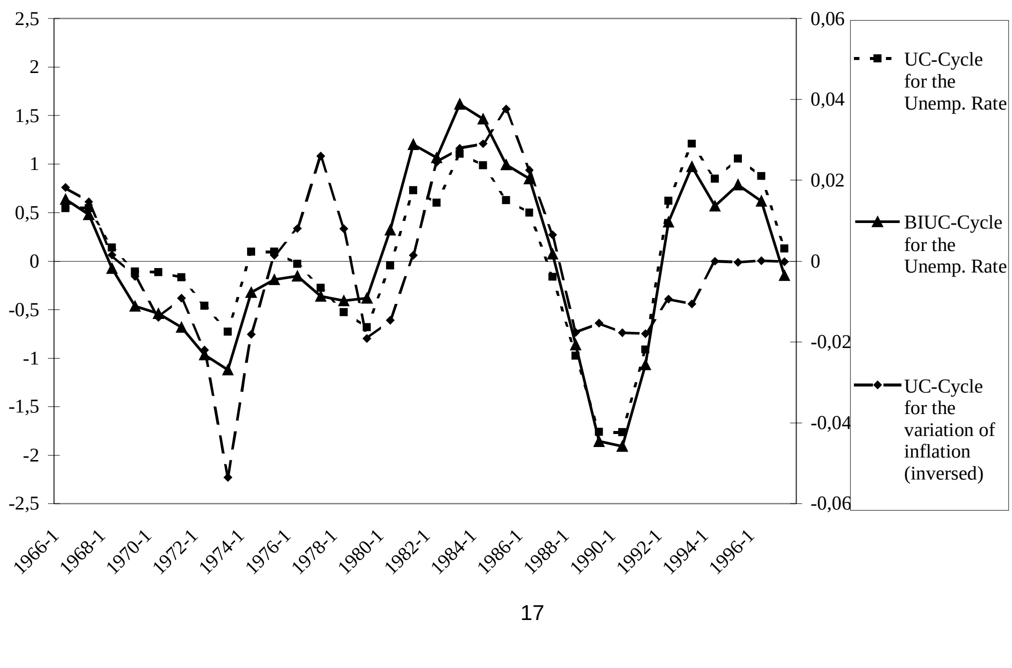
On the other hand, we do observe a significant divergence between the two univariate cycles in some years. This tends to suggest that retaining the univariate unemployment cycle as the common cycle may be an over simplistic approximation. Thus, attempts to use combined information on inflation and unemployment may, indeed, be worth pursuing. Figure 14 presents our bivariate estimate for the common cycle, along with the two univariate cycles. It seems that our bivariate estimate does adequately combine all the available information. For instance, we observe a dampening of the cycle whenever the evolution is not common to both univariate series and *vice versa*. This desirable feature of the bivariate cycle should improve the quality of the unemployment gap estimate.

Figure 13 - Relationship between the two Cycles (Unemp. Rate and variation of Inflation)
Univariate UC-Models



Source (Figures 13 and 14): Commission Services (AMECO Database)

Figure 14 - Putting the Bivariate cycle (BIUC) in context with the two Univariate cycles



4. CONCLUDING REMARKS

A variety of statistical methods and econometric techniques can be used attempting to disentangle the non-cyclical trend component of a time series and its purely cyclical part. This note has served the purpose to demonstrate the potential contribution from the use of unobserved components modelling techniques to decompose the EUR-11 unemployment series. In general, unobserved components models appear to be an attractive and quite flexible tool to discriminate between the cyclical and the trend component in unemployment; in particular, the multivariate version of the model allows to use information contained in the price series to assist the decomposition of the unemployment rate. Consequently, this specification is potentially closer to the NAIRU concept than univariate filtering techniques.

The results of our analysis indicate that attempts to use combined information on inflation and unemployment to extract the cyclical component in unemployment may indeed be worth pursuing. In particular, the multivariate model produces a fundamentally different evolution for the slope of trend unemployment in the euro area. Euro area unemployment has been estimated to be close to its trend value at the turn of the century. The empirical results also suggest that a one percentage point unemployment gap has been matched by a cyclical variation in inflation of -1.3 %.

Bibliography

Fabiani, S. and Mestre, R. (1999). "Alternative Measures of the Nairu in the Euro Are : Estimates and Assessment", European Central Bank, mimeo.

Harvey, A. C. (1989). “Forecasting, Structural Time Series Models and the Kalman Filter.” Cambridge University Press, Cambridge.

Harvey, A. C. and Jaeger (1993). “Detrending, Stylized Facts and the Business Cycle.” Journal of Applied Econometrics 8, pp. 231-47.

Kuttner, K. N. (1994). “Estimating Potential Output as a Latent Variable.” Journal of Business & Economic Statistics 12, pp. 361-68.

Maravall, A. (1996). “Unobserved Components in Economic Time Series.” Banca de Espana, Working Paper No. 9609.

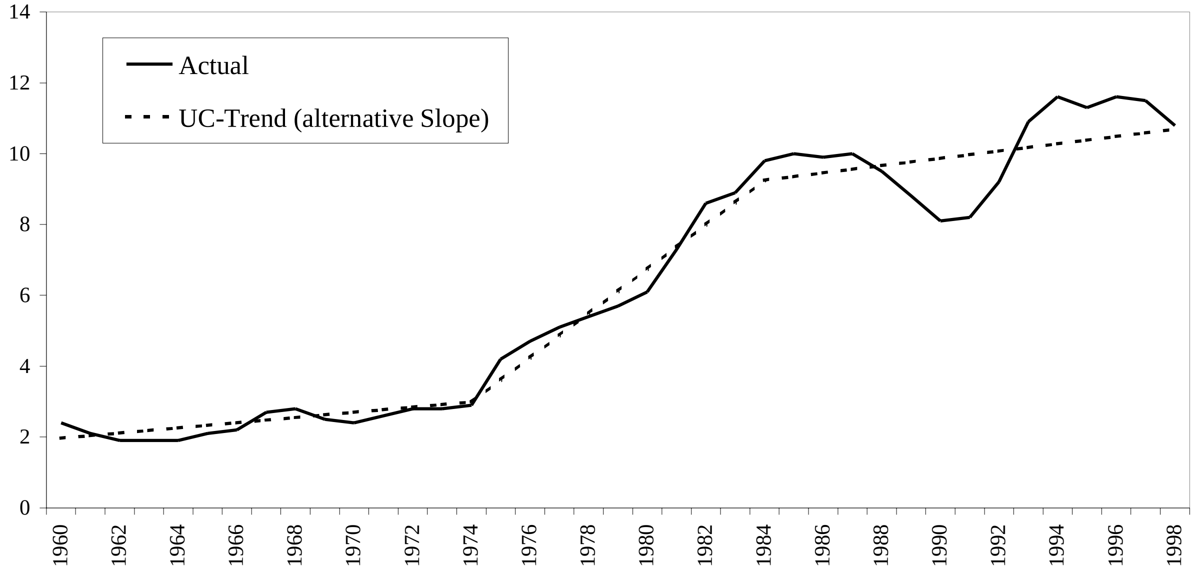
Mc Adam, P. and Mc Morrow, K., (1999). "The NAIRU Concept - Measurement uncertainties, hysteresis and economic policy role", European Commission Economic Papers, n° 136.

Orlandi, F. and Roeger, W. (1999). "The Unobserved Components Method for Calculating Output Gaps", Technical Note for the EPC Working Group on Output Gaps, DG ECFIN, mimeo.

Pichelmann, K. (1999). "A Few Stylised Facts about Euro Area's Labour Market(s)", Internal Seminar, DG ECFIN, mimeo.

Annex

Figure Annex - Univariate UC-Model (with alternative slope)
EUR-11 Unemployment Rate



Source: Commission Services (AMECO Database)

Table A1 Diagnostics for the Univariate Model, 1960-98.

	Statistics	*Significance*
Normality	0.44	0.80
Heteroskedasticity	7.10	0.0009**
Autocorrelation (up to 11 lags)	4.83	0.56
DW	1.77	
R^2	0.27	

Table A2 Diagnostics for the Bivariate Model (Common Cycles), 1964-98.

	Unemployment Rate Equation		Variation of Inflation equation	
	Statistics	*Significance*	*Statistics*	*Significance*
Normality	0.13	0.93	1.33	0.51
Heteroskedasticity	3.17	0.03*	0.30	0.96
Autocorrelation (up to 11 lags)	3.86	0.69	8.36	0.21
DW	1.46		2.02	
R^2	0.39		0.66	

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