An alternative to the mainstream model of inflation with an application to Switzerland

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The inflation rate and the question of its determining process is not the only concern for central bank policy, but in most of the developed countries undoubtedly a primary one. The model of price change underlying the thinking of economists in general, and of central bankers as well as other policy makers in particular, is dominated by the so-called price Phillips-curve approach. It can be characterised by three main features. Firstly, the inflation rate is crucially dependent by the degree of aggregate resource utilisation. A couple of statistical indicators are preponderantly used, either alternatively or in conjunction, to provide representative utilisation measures. Most commonly applied is the general unemployment rate, as an inverse measure, and the GDP-gap, the difference between the economy's actual and potential real output, as a direct measure. To avoid obvious repetitive-type formulations, the unemployment rate will in general be singled out in the following text as the representative measure of aggregate resource utilisation. Secondly, the inflationary impulse generated by the degree of aggregate resource utilisation is partially or fully propagated forward in time by inflationary expectations which are formed on the actual inflation process. With partial propagation, this model can be summarised by a negatively sloped relationship between inflation and the unemployment rate. Thirdly, in case inflationary expectations fully respond to actual inflation, there is a unique level of the unemployment rate at which the inflation rate is constant. This is the concept of the so-called NAIRU, the non-accelerating-inflation rate of unemployment. Any given positive or negative deviation of unemployment from this unique level of the NAIRU is supposed to generate a corresponding acceleration or deceleration of the inflation rate. This implies that the long-run Phillips curve forms a vertical line in a two-dimensional diagram with inflation on the vertical and unemployment on the horizontal axis. Looking at the international research output on inflation and related economic policy issues, this NAIRU view of the inflation process is taken seriously by many economic theorists, econometricians and policy practitioners, not least in the central banks and some prestigious multinational economic and monetary organisations.

It is the position taken in this paper that the Phillips curve and the associated NAIRU are seriously flawed concepts, and that a very adequate alternative explanation of the inflation process exists. This position is based both on theoretical and empirical grounds.

A first argument against modelling the inflation process according to the Phillips curve derives from statistical considerations of the stationarity properties of the time series for the inflation rate, on the one hand, and the unemployment rate (or the GDP-gap based on an aggregate production function and potential input approach) on the other. There is evidence for Switzerland, as well as for other countries, that the inflation rate preferably should be viewed as a stationary I(0) process and the unemployment rate as a non-stationary I(1) process. This implies that for a valid model the inflation rate should in principle be related to the change in the unemployment rate, as they are both stationary I(0) variables. In other words, a stationary relationship involving the non-stationary level of the unemployment rate could only exist by cointegration with the price level, not its rate of change.

A second argument against modelling inflation according to the NAIRU approach is based on the solution of the second-order differential equation corresponding to the standard Phillips-curve model with NAIRU properties.

That model forming a negative relationship between the rate of change of the inflation rate and the level of unemployment can be stated as:

$$\ddot{p}(t) = -\alpha u(t)$$

where the symbol $\ddot{p}(t)$ stands for the second time derivative of the price level p at time t and $u(t)$ for the corresponding unemployment rate (measured as a deviation from an inflation-neutral base level). From this the following general solution for the price level can be derived:

$$p(t) = c_1 + c_2 t + \alpha \int_{t_0}^{t} u(\tau)\tau \, d\tau - \alpha t \int_{t_0}^{t} u(\tau) d\tau$$

with initial conditions for the price level and the inflation rate and $p(t_0) = p_0$ and $\dot{p}(t_0) = \dot{p}_0$ respectively.

From an economic point of view, the price level theory implicit in this deterministic integral equation appears rather implausible. Apart from the homogeneous solution which forms a constant-coefficient linear time trend of unspecified origin, the price level is determined only by the complicated time-weighted history of the unemployment rate. The farther back in time a given unemployment rate was experienced, the stronger is its cumulated influence on the price level.[1] There are no further determinants. In particular, any influence from the uneven temporal development of prices in the rest of the world as well as of exchange rates remains completely neglected in this pure NAIRU version of the price Phillips curve.

There are, of course, also less extreme versions of Phillips type relations, including A.W.H. Phillips' famous original paper, which make some allowance, at least in principle, for a secondary influence from import price changes in the inflation process. It is, however, the contention of this paper – in broad agreement with the so-called Scandinavian model of inflation[2] – that in the typical open economy the domestic currency price of foreign goods and services is not only a secondary, but a primary force in domestic inflation. This important determinant can, in turn, be split into foreign price changes measured in foreign currency and changes in the domestic price of foreign currency. The neglect of this aspect, or its only secondary consideration in several inflation models, seems to be representative of a current norm among economists in general.

Cyclical fluctuations in domestic employment and output play also a significant role in the inflation process, but their direct influence tends to be much smaller on average than the influence from changes in foreign prices and the exchange rate. Moreover, as suggested in the first critical argument above, in many, if not most countries, this secondary force on inflation is likely to be related to the changes and not the level of the unemployment rate.[3]

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1 This shows up still more clearly in the discrete-time equivalent to the integral solution equation:

$$p_t = c_1 + c_1 t - \alpha \sum_{\tau=0}^{t-1} (1+\tau) u_{t-\tau}.$$

2 For a survey in English of the Scandinavian input-output model of inflation by its Norwegian originator see Aukrust (1997). The first econometric implementation of the corresponding (also noneconometric) study for Sweden by Edgren, Faxén and Odhner (1973) was Ettlin (1974). It was integrated into a full econometric model context in Ettlin et al. (1979).

3 In Ettlin (1974) and Ettlin et al. (1979) the wage and price levels, not their respective rates of change, were furthermore explicitly related to the level of the unemployment rate. This implied an aggregate domestic supply curve with a positive slope with respect to the employment rate rather than a Phillips-curve relation. The former type of relationship regarding wages has recently been termed "the wage curve" by Blanchflower and Oswald (1994), who found it empirically confirmed in a huge set of disaggregated data from a large number of countries. Perhaps, "the price curve" would be an appropriate term for the price level relationship with the unemployment level. Sargan (1964) seems to be the first econometric study of price and wage formation which made allowance for the primary

A basic version of the alternative inflation model for an open economy can be derived along the following lines. A country's gross output is assumed to be generated according to two distinct log-linear aggregate production functions, one for the tradables and the other for the non-tradables sector (called exposed and sheltered sectors respectively in the Scandinavian model literature). Labour, capital as well as imports serve as production factors, and technical progress proceeds at differing rates in the two sectors. Demand for the output of domestically produced tradables and non-tradables depends log-linearly on domestic and foreign real income and on the supply prices of domestic and foreign tradables and non-tradables. In this type of environment, instantaneous profit maximisation with regard to all the factor inputs yields long-run optimal prices of tradables and non-tradables. The logarithm of the prices of domestically produced tradables and non-tradables is a log-linear function of the factor prices for labour, capital and imports with the coefficients determined chiefly, and in case of constant returns to scale entirely, by the respective output elasticities of the factors.

Money wage rates generally respond to the conditions pertaining in the sector exposed to international competition. This, firstly, refers to the development of foreign prices measured in domestic currency and, secondly, to the faster rate of technical change in the largely goods-producing tradables sector. It implies that, on average, unit labour costs and prices rise faster for non-tradables than for tradables. As a result, the total rate of price change of consumer expenditures, with their large share of non-tradables will tend to exceed the rate of price change of tradables.

The latter point provides an important part of the explanation for the persistence of above-target rates of change of consumer prices even in countries like Germany and Switzerland. There, in spite of monetary policies mainly geared to price stability, the target rates of inflation of zero or one percent were overshot by at least a couple of percentage points on average since the mid-1970s. If the annual rate of growth of technical progress for non-tradables is, for example, 3 percentage points lower than for tradables, then the price rise of non-tradables will tend to exceed that of tradables by 3 percentage points. With a share of, say, two-thirds for non-tradables in total consumer expenditures a 2% inflation rate would result on that account alone.[4]

The specification of the alternative inflation model is, like the price Phillips-curve, a quasi-reduced form or system's solution of structural equations for wages and prices. But as outlined above, the structural equations of the alternative model are quite distinct from the corresponding Phillips-curve relations. The result is a model specification in which the inflation rate of consumer prices (ΔLPC) depends on the current and particularly also the lagged rate of change of import prices ($\Delta LPIM$) as well as a positive constant for the intercept reflecting both the effect of the sectoral productivity growth differential on total unit labour costs and the average rate of growth of unit capital costs and unit indirect taxes.

The relevant price of tradables is, in fact, more directly related to the price of exports. But the latter is an endogenous variable that is substituted out in the reduced-form specification in favour of its major determinant, the price of imports, which has a more exogenous character.

The influence of the domestic business cycle on wage and price determination is reflected also by the (lagged) unemployment rate as in Phillips-curve models, but, in contrast to the latter, it is a priori expected that the change rather than level of the (logarithm of the) unemployment rate ($\Delta LUNR$) affects the inflation rate. The short-run elementary version of the alternative model can thus be formally stated as :

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importance of import prices and correctly interpreted the role of the unemployment variable, at least in the long-run solution he derived from the estimated equations. But, as a 90% adjustment to a new equilibrium was estimated by Sargan to take almost 11 years, his results did not differ that much in the short and medium run from conventional Phillips-type studies.

4 On that issue, see also Krugman (1996).

$$\Delta LPC = \alpha_0 + \alpha_1 \Delta LPIM + \alpha_2 \sum \gamma_i \Delta LPIM_{-x-i} - \alpha_3 \Delta LUNR_{-y}$$

The estimated price change equations presented in Table 1 provide empirical evidence on these issues for Switzerland. Since the change of the logarithm of consumer and import prices as well as the change in the logarithm of the unemployment rate are stationary I(0) variables, a stationary short-run relationship is estimated in equations 1 and 2. They are simplified versions of the alternative error-correction model to be shown in Table 3. To limit the specification at first to the most essential variables only, the sample period in Tables 1 and 2 ends in 1994.[5]

Table 1

Basic quarterly rate of change equations of the Swiss consumer price index 1976Q1-1994Q4

Dependent variable: Δ *LPC*				
Regressors:	**Equation 1**	**Equation 2**	**Equation 3**	
Intercept	0.006 (10.21)	0.007 (11.16)	0.004 (3.03)	
Δ *LPIM*	0.200 (6.70)	0.207 (7.29)	0.187 (4.69)	Regressors of alternative model
Δ *M8PIM*$_{-3}$	0.340 (6.19)	0.308 (5.80)	0.291 (4.01)	
Δ *LUNR*$_{-6}$		-0.008 (3.00)	-0.011 (2.32)	
LUNR$_{-6}$			0.001 (1.37)	
Δ *LPC*$_{+1}$			0.080 (0.79)	Regressors of mainstream Phillips-curve model
Δ *LPC*$_{-1}$			0.101 (0.97)	
Standard t-statistics are shown in parenthesis below the estimated coefficients.				
Summary statistics:				
Standard error of regression	0.005 (0.48%)	0.005 (0.45%)	0.005 (0.46%)	
Adjusted R-squared	0.446	0.501	0.494	
Durbin Watson statistic	1.741	1.799	2.050	
Number of observations	76	76	76	

[5] The variables are explained at the end of this paper.

In equation 1 the change of the logarithm of import prices appears first unlagged with a significant coefficient of 0.20. This reflects mainly the direct input price effect from imports on consumer prices. The second import price term with a similarly significant coefficient of 0.34, refers to the change in an eight-quarter moving average, which is lagged by three quarters. This influence on consumer prices is to be interpreted as an indirect one via the determination of wages and unit labour costs. Finally, the highly significant intercept term of 0.006 implies a time trend of 0.6% per quarter or 2.4% per annum in the price level. According to the alternative model, it is in principle agreement with the expected result from lower productivity growth in non-tradables than in tradables production. This interpretation is supported by the fact that the average inflation rate for consumer services is much higher than for consumer goods. A part of this time trend is, however, also due to the average rate of growth of nominal unit capital costs and unit indirect taxes, both of which do not appear explicitly as regressors.

Equation 1 explains 45% of the variance of the inflation rate without making use of the positively autocorrelated characteristic of inflation. Equation 2 contains additionally the lagged change in the unemployment rate, also in accordance with the alternative model. The specified time delay of six quarters for the change of unemployment reflects mainly the lag in the determination of wages and unit labour costs but also some lag of consumer prices behind unit labour costs. This time delay approximately matches the total mean delay of the lagged moving average import price term identified above as the primary empirical determinant of consumer prices via wages and unit labour costs. The correctly signed and significant coefficient estimate of the change of the logarithm of the unemployment rate is -0.008. This implies, for example, that a doubling of unemployment from a level of 0.5% to 1% or from 1% to 2% will, after a delay of six quarters, reduce the inflation rate by about 0.6%. But with no further change in the level of unemployment assumed, the inflation rate will thereafter be unaffected by the unemployment situation. In other words, in a two-dimensional Phillips-curve diagram, with the inflation rate on the vertical and the unemployment rate on the horizontal axis, this long-run partial relationship forms a horizontal line,[6] in contrast to a vertical line for the NAIRU model. The height of this horizontal line is, of course, mainly determined by the current and lagged changes in import prices and the factors subsumed into the intercept term. The comparison of equation 2 with equation 1 shows that the addition of the change of unemployment variable, although significant, affects the estimated coefficients of the other regressors only to a limited extent. According to the adjusted R-squared statistic the explained portion of the variance of the inflation rate rises, but only moderately from about 0.45 to 0.50. In other words, the results of equations 1 and 2 suggest that over an almost twenty-year period the actual variations in the unemployment rate within a range of almost 0–5% were only a very secondary force in Switzerland's inflation experience compared to the dominant forces that emanated from variations in import prices and a positive trend factor, presumed to reflect the productivity growth differential between the tradables and non-tradables sector and the growth of nominal unit capital costs and unit indirect taxes.

In Equation 3 a basic set of regressors from the mainstream Phillips-curve model is added to the elementary version of the alternative model. All the coefficients of the alternative model variables remain correctly signed and significant, whereas no coefficient of the mainstream model variables achieves standard levels of significance. The coefficient of the unemployment level is wrongly signed, and price change expectations modelled generously on the actual inflation rates one period ahead (!) and one period behind have only a minor impact on the coefficients of the alternative model. Moreover, the rather small size of the coefficients of the actual inflation rates surrounding the current period suggests that inflation expectations do not play the crucial role attributed to them in the mainstream model. It is clear from these empirical results for Switzerland that the alternative model entirely encompasses the mainstream model.

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6 Positive and negative changes of unemployment will, cet. par., lead to temporary deviations of the inflation rate from this horizontal line. These transitory observations will result in a scatter with a negative slope like a short-run Phillips curve.

Table 2 shows some estimation results for the mainstream model alone. In equation 4 the level of the unemployment rate is entered for two successive periods, with the six quarter lag again being empirically determined. According to the mainstream model the respective coefficients should either be significantly negative or one significantly negative and the other insignificantly different from zero. This is clearly not born out by the results which show a negative coefficient an lagged unemployment being matched by a similar positive coefficient an unemployment lagged by an additional period. This points towards the change of unemployment effect on inflation in accordance with the alternative model. With these kinds of results being rather typical for other countries as well, it comes as no real surprise that the dedicated pursuit of the Phillips-curve approach has, for various countries, resulted in the hypothesis of a natural rate of unemployment which empirically tends to follow the actual rate: The presumed unemployment level, measured as a deviation from the adapting natural rate, becomes, in fact, an approximation to the change of unemployment!

Table 2

Mainstream-related quarterly rate of change equations of the Swiss consumer price index 1976Q1-1994Q4

Dependent variable: ΔLPC			
Regressors:	**Equation 4**	**Equation 5**	**Equation 6**
Intercept	0.002 (1.88)		0.004 (3.99)
$LUNR_{-6}$	-0.006 (1.97)	-0.005 (1.52)	
$LUNR_{-7}$	0.005 (1.75)	0.004 (1.25)	
ΔLPC_{+1}	0.343 (3.56)	0.439 (5.28)	
ΔLPC_{-1}	0.348 (3.48)	0.443 (5.05)	0.451 (4.29)
Standard t-statistics are shown in parenthesis below the estimated coefficients.			
Summary statistics:			
Standard error of regression	0.005 (0.52%)	0.005 (0.53%)	0.006 (0.58%)
Adjusted R-squared	0.340	0.317	0.188
Durbin-Watson statistic	2.446	2.677	1.950
Number of observations	76	76	76

The future and past actual inflation rates in equation 4 have correctly signed significant coefficients summing to 0.69. But this result only appears because the estimated equation is primarily a statistical lead-lag autocorrelation relationship with little autonomous economic substance added by the presumed impulse variable, the unemployment level.

In equation 5, where the intercept term is suppressed, the coefficients of the two unemployment level variables again show opposite signs, which accords with the alternative model's change of unemployment specification, although these coefficients are not significantly different from zero according to standard criteria. This again leaves it foremost to the two lead-lag actual inflation rates to explain the variance of the current inflation rate. Under these circumstances and in view of the univariate autocorrelation relationship, the correct signs, the magnitude and the significant t-values of the latter two coefficients come as no surprise. But this is not sufficient to confirm the crucial propagator role of inflation expectations as expounded in the mainstream view. Finally, the first-degree positive autocorrelation of the time series for inflation is illustrated in equation 6 without interference from any other variables. This univariate relationship, again, is no proof that inflation is preponderantly or fully propagated by inflation expectations.

Table 3

Error correction model for the consumer price index of Switzerland 1976Q1-1996Q4

Dependent variable: LPC	**Equation 7**	**Equation 8**
Regressors:	**Level equation**	**First-difference equation**
Intercept	3.648	
	(53.42)	
LPC_{-1}		0.180
		(2.07)
LPIM	0.039	0.074
	(2.90)	(1.80)
$LPIM_{-1}$	0.039	
	(2.90)	
LPIMERS	0.206	0.152
	(6.21)	(3.67)
$M8LPIM_{-3}$	0.322	0.246
	(27.29)	(5.28)
TR	0.006	0.005
	(61.82)	(7.81)
TR90Q392	0.005	0.002
	(22.68)	(1.87)
$M2LUNR_{-5}$	-0.009	-0.008
	(9.12)	(3.38)
VAT	0.008	0.011
	(2.61)	(2.88)
LEVEL-EQUATION RESIDUAL$_{-1}$		-0.571
		(5.68)
The numbers in parenthesis below the estimated coefficients are the absolute values of the t-statistic. Standard distribution assumptions concerning these t-statistics, however, apply only to the first-difference equation.		
Summary statistics:		
Standard error of regression		0.004 (0.36%)
Adjusted R-squared		0.685
Durbin-Watson statistics	0.970	1.858
F-statistic (8,75)		23.526
Number of observations	85	84

Equation 2 shown in Table 1 above represents a basic version of the alternative inflation model. Equations 7 and 8 in Table 3 below provide a fuller version which makes use of the cointegration and error correction approach. Equation 7 estimates the relationship between the consumer price level and the level of current and lagged import prices, a segmented time trend, and the lagged level of the unemployment rate. Finally, the model explicitly incorporates the changeover from the sales tax to the value-added tax in 1995, which was by far the largest discretionary increase in the level of indirect taxation on consumption in the sample period.

The estimation results of the cointegrated level equation 7 confirm the a priori expectations of the alternative model to a remarkable extent. In particular, the magnitudes of the coefficients for the direct and the indirect influence of import prices on consumer prices seem to be relatively close to the actual share of import and labour costs in total consumption. Their sum of 61% would leave 39% to unit capital costs and unit indirect taxes, if the aggregate production functions incorporate constant returns to scale. The time trend reflects the lower productivity growth in non-tradables than in tradables production alluded to above and the trend rise of unit capital costs and unit indirect taxes (apart from the introduction of VAT, which is modelled explicitly). The second time trend variable reflects an intermittent phase of faster growth of productivity in tradables production in the early 1990s, which increased the inflation-contributing productivity differential with regard to non-tradables. The origin of this development was more rapid technological and structural change in export and import-competing activities, firstly in the wake of political and economic transformation in Eastern Europe, epitomised by German unification in mid-1990, and secondly by a speed-up of globalisation of economic activity in general. It is assumed in the specification, that the previous lower productivity growth differential was re-established in 1993 on account of a corresponding speed-up of productivity growth also in non-tradables. The level of unemployment with an average time lag of 5½ quarters reflects the pressure of demand in the labour market. It mainly affects price determination via wage formation. It should be observed that in Switzerland wages are mostly adjusted at the beginning of each year (few staggered contracts) with wage negotiations typically having taken place in the third and fourth quarter of the preceding year. This alone implies a mean lag for wage compensation of at least 3½ quarters behind observed import price developments and unemployment. Furthermore, there is some mean lag in the propagation of unit labour costs to consumer prices. Therefore, the empirically determined mean lags of 5½ quarters implied in the moving average terms for import prices and the unemployment rate appear quite plausible. Finally, the coefficient of the VAT dummy variable provides a reasonable estimate of the price level impact of the discretionary indirect tax increase in 1995.

The estimation results in Table 3 of the error-correction equation 8 for the quarter-to-quarter inflation rate confirm the estimates in the cointegration level equation 7. The highly significant coefficient of -0.57 for the lagged residual from the level equation – the error correction term – provides confirming evidence for the stationarity of the cointegration equation (which contains non-stationary I(1) variables). According to the magnitude of this coefficient more than half of any deviation of the actual price level from its equilibrium as determined by equation 7 will be corrected with a time delay of one quarter. After three quarters, more than 90% of the original deviation will have disappeared already. Moreover, as most of the other coefficient estimates of the first-difference equation 8 are quite similar to the corresponding estimates in the cointegrated level equation 7, the level equation residuals will tend to be small. The model accounts for 68% of the total variance of the inflation rate. The residual standard error of the first difference equation corresponds to 0.36% of the price level, which is less than half of the total standard deviation of the actual inflation rate.

Summarising, it is evident that the alternative inflation model outlined and estimated for Switzerland decidedly encompasses the mainstream Phillips-curve model. What does the estimated model in Table 3 imply with regard to the Swiss inflation experience during the last two decades? It was overwhelmingly related to the fluctuations in the rate of change of import prices expressed in domestic currency. Thus, the low inflation rates around 1976-78, 1986-88, and 1994-96 coincided with small or even negative current and lagged import price changes. Similarly, the high inflation episode around 1981-82 and, to a somewhat lesser extent, also the one around 1990-91, was

accompanied by a large acceleration of import price changes. But the contribution of import prices to the average rate of inflation was only secondary compared with the much stronger time-trend related effect which is mainly attributable to the productivity growth differential. Finally, the development of the unemployment rate had only some secondary impact on the cyclical course of inflation.

The major implication for economic policy is, in brief, the suggestion that the widespread emphasis on the primary role of unemployment in the inflation process in general and the NAIRU view of a crucial threshold unemployment rate in particular does not appear to be justified. The derivation of detailed monetary policy implications requires that the alternative inflation model is analysed jointly at least with appropriate models of the exchange rate, interest rates and real economic activity. Although suitable empirical versions of these model requirements are presently available in Ettlin and Bernegger (1994) and Ettlin (1994, 1996), such a joint analysis, including relaxed exegoneity issues, will have to be the subject of a separate study.

List of variables

LPC, LPC_{+1}, LPC_{-1}	Natural logarithm of the consumer price index of Switzerland, for the current, succeeding and preceding quarter, respectively.
LPIM	Natural logarithm of the implicit deflator of total imports of goods and services.
LPIMERS	Natural logarithm of the unit value index of imports of energy, raw materials and semi-manufactures.
$M8LPIM_{-3}$	Eight-quarter moving average of *LPIM*, lagged three quarters.
$LUNR_{-6}$	Natural logarithm of registered unemployment as a percentage of the labour force, lagged six quarters.
TR	Integer linear time trend with 1976Q1=1.
TR90Q392	Integer linear time trend starting with 1990Q3=1 and ending in 1992Q4.
VAT	Dummy variable equal to zero until 1994Q4 and unity from 1995Q1 on, when a value-added tax replaced the previous more narrowly based sales tax.
Δ	First (backward) difference of the indicated variable.

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Comments on: "An alternative to the mainstream model of inflation with an application to Switzerland" by Franz Ettlin

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by Wilhelm Fritz

In this paper, the author takes the position that to explain the inflation process "the Phillips curve and the associated NAIRU are seriously flawed concepts". It is worth distinguishing between the NAIRU-model, which is essentially an empirical construct, and the natural rate hypothesis, which is actually the concept the author attacks. Clearly, when looking at unemployment in Switzerland since the second world war it is not obvious what the "natural" unemployment rate could be. A lengthy period of practically zero unemployment came to an end due to the oil crises and since the beginning of the 1990s, Switzerland experienced a considerable increase to now more than 5%, a level considered unthinkable by many just a few years ago.

As an alternative to a Phillips-curve specification, the author presents a price-wage model in levels and estimates it via an error-correction equation. This approach is not new. Already in the early 1960s Sargent presented a real-wage model for the United Kingdom which was extensively used until it broke down in the face of the first oil crisis. It has since been resurrected and virtually all the current macro-models in the United Kingdom have wage-price equations estimated as error-correction equations.

How does one justify a level model? As is mentioned in the paper, one argument runs along the dynamic properties of the price, wage, unemployment and GDP gap series. For a Phillips curve, both price changes and unemployment should be stationary, but they rarely are. It would be helpful if the paper contained some stationarity test.

A second justification can be derived from theory. The paper highlights the implication for the determination of the price level which are implicit in the NAIRU concept. However, instead of criticising a specific variant of the Phillips curve, the author could explain the theoretical underpinning for his own price level equation which actually seems to be a level-version of the Nordic Model of Inflation which emphasises the role of the external sector in the price formation process. Even in this context, several formulations could be discussed, all of which serve to underline the crucial role of foreign prices for smaller countries.

The author regards imports as intermediate goods and includes them in an extended production function. Alternatively – or complementing this formulation – he could have looked at the prices of export or final import goods. One could assume that the exporting firms face a price constraint which via profit maximisation naturally leads to real wages as a crucial variable. Similarly, one could assume that firms competing with final import goods face a price constraint. In the Nordic tradition, export prices have been crucial in determining domestic wage and price trends while in the French version of the Nordic model the import price channel is crucial. Anyway, it would be helpful if the model were explained. This way is would also be easier to understand why lagged import prices capture the effect of wages.

In estimating the error correction model the author uses the two step-procedure although it is now generally accepted that a one-step procedure (with the price change as the dependent variable and both first difference and level variables on the right-hand side) is more efficient. Nevertheless, the estimation results support the author's view that a level formulation outperforms the usual Phillips-curve specification and that the development of import prices has had a major influence on the Swiss inflation experience during the last two decades.