Hysteresis and Persistence in Unemployment: a Definition.

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Abstract

There exists no consensus regarding the definition of persistence. This paper reviews this issue and proposes an economic definition to persistence.

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1 Introduction

Unemployment returns about one third of the way to its normal level each year after a shock displaces it (Hall (1998, p. 34)). This is the case for the U.S.A. and Canada. Persistence in unemployment has long been documented, explored and investigated at the theoretical and applied levels.

There does not currently exist a consensus in the empirical literature on the definition of 'hysteresis' in unemployment. Different authors use different definitions for this term. As many contributions confuse 'hysteresis' with 'persistence', the first step in our investigation is to address this issue. Section 2 presents the origin and history of hysteresis and explains its role in economics. Section 3 presents the implications and the consequences of the hysteresis, whenever evidence is found. Section 4 reviews the factors that cause and the proposed theories put forth to explain hysteresis. Section 5 reviews a selected set of articles on evidence of economic hysteresis. Finally, Section 6 defines economic persistence.

2 Hysteresis in economics

The basic principle of hysteresis was well recognized by economists - such as Frisch, Kaldor and Schumpter[1] - well before its revival in the seminal work of Blanchard and Summers (1986).

Two vague ideas revolve around the use of this term in economics. The first is the path dependence property and the second is the permanent effect of transitory shocks. The former imply that the equilibrium state of the system depends on the

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[1] See Cross and Allen (1988).

transition towards it while the latter underlines the persistent effects of a shock to the system. The latter property is a major source of confusion between what is known as the 'unit root persistence in discrete time'[2] and 'hysteresis'.

In the literature, 'hysteresis' is generally defined as a particular type of response of a non-linear system when one modifies the value of the input: the system is said to exhibit the remanence property when there is a permanent effect on output after the value of the input has been modified and brought back to its initial position. Briefly, hysteresis occurs in non-linear models that exhibit multiplicity of equilibria and the remanence property. On the other hand, 'unit root persistence' lacks the remanence effect with asymmetric persistence mainly in linear models. Two forms of hysteresis are well documented: the weak form at the micro level and the strong form (aggregation of a large number of heterogeneous[3] agents) at the macro level.

The path dependence property, used by Blinder (1988), was described as (in the hysteresis section) "*... for these (models) bring Keynesian economics* [in which the economy can get stuck in low level production] *with a vengeance"*[4] (my emphasis). Briefly, the hysteresis notion implies the non-uniqueness and the path-dependence of the natural rate. Also, it revives the Phillips curve trade-off not in levels but in first differences.

In most textbook cases, testing persistence in a general series y_t uses,

$$\Delta \ln y_t = a + b\left[\ln y_{t-1} - (\alpha - \beta(t-1))\right] + \varepsilon_t \tag{1}$$

where t denotes the trend and Δ refers to the first difference linear operator. If y reverts toward its trend, then b is negative and non-zero. If it does not, then b is zero. Rewrite equation (1) as in Romer (1996, p. 176),

$$\Delta \ln y_t = \alpha' + \beta' t + b \ln y_{t-1} + \varepsilon_t \tag{2}$$

where $\alpha' \equiv a - b\alpha + b\beta$ and $\beta' \equiv -b\beta$. The usual test is $H_0 : b = 0$ (permanent shock where y does not revert to trend and has a unit root) versus $H_1 : b < 0$ (trend reversion).[5]

3 Implications of hysteresis for policy analysis

The concept of the natural rate of unemployment - since its introduction by Friedman in an analogy to Wicksell's concept of the natural rate of interest and its formulation by Phelps - applies the doctrine of monetary neutrality to the unemployment level. Monetary policies are neutral in the long term if they only affect nominal variables and have a transient effect on the unemployment rate which converges sooner or later to its natural level. As Friedman put it " It [the natural rate] is the level that would be ground out by the Walrasian system of general equilibrium equations." In the early 1950's and through the 1960's and 1970's, the Phillips curve became the major policy trade-off.[6] However, the experience of stagflation in

[2] A special case of the 'zero root dynamics' in physics.

[3] Called 'hysteron'.

[4] Also, from the conclusion section "... and hysteresis seems to characterize some economies some of the time, not all economies all the time ...".

[5] See also Nickell (1985, p. 119).

[6] For a survey of the natural rate hypothesis evolution, see Goodinson and Frohlich (1994).

the 1970's cast some doubts on the usefulness of the Phillips Curve and the natural rate of unemployment hypothesis as a policy tool and a policy goal. Many voices suggested correcting the hypothesis to explain what happened and a few went even further to discard the hypothesis (see Blanchard et al. (1988) and Goodinson et al. (1994)). Hysteresis was adopted to explain the behaviour of high unemployment even when the initial shock (supply shock) to the economy was removed. Hysteresis - juxtaposed with the NAIRU - is an explanation of how the natural rate is affected by the disequilibrium path of the economy, and in a way discredits both the Phillips Curve and the natural rate of unemployment hypothesis. Given hysteresis, the NAIRU would be unstable.

Hysteresis is not a concept which can be accommodated within the natural rate hypothesis or within the classical doctrine of neutrality. The natural rate proponents tried to amend hysteresis by postulating that the natural rate will be a strong attractor for actual unemployment in the long-run. However, the debate still goes on. A survey of the seminal contributions to the natural rate[7] hypothesis is presented later.

The high unemployment rate in Europe and in Canada in the 1990s can be explained by labour market rigidities that cause high costs of adjustment for firms. To investigate such an explanation, the empirical agenda would rely on pin-pointing the factors that have caused wage and price equations to shift. The increase in unemployment could be due to the increase in unemployment insurance benefits measured by a generosity index or due to hysteresis. The debate on this is still open. If the actual unemployment rate is high because it is high relative to its natural rate, one should observe a decrease in inflation rates (a recessionary gap in aggregate demand / aggregate supply analysis); otherwise, one's intuition tends to suspect that the natural rate itself is high.

Whenever evidence of hysteresis is found, there exists room to decrease the unemployment rate without changing any structure in the organization of the labour market. How fast the unemployment rate can be decreased depends on the hysteresis mechanism. Also, disinflation policies based on the unemployment rate will prove very costly in terms of lost output. Since unemployment exhibits hysteresis, it will never go back to its original starting point. This is a vital implication of hysteresis, and applies to the Bank of Canada's disinflation policies pursued in 1981-1982 and again in 1988. When hysteresis is present, the short-run adjustment of the economy can take place over a very long period.

4 Factors and theories

This section reviews the proposed factors in the literature that cause hysteresis and the theories that explain it. The factors can be classified into the following categories: 1) aggregate variables where long periods of low growth and investment decrease the potential of the economy, 2) human capital where a long spell of unemployment leads to deterioration of skills and work ethic and 3) the price mechanism where the wage formation process, in wage bargaining context, is responsible for hysteresis.

The theories that explain hysteresis are:

[7] Note that the mechanics of measuring the natural rate of unemployment is not of interest here.

1) Duration theory.

This is concerned with the negative effects of unemployment duration on the labour demand and the labour supply of the unemployed. The human capital story explains this as follows. The longer an unemployment duration is, the less likely is an unemployed worker to be offered a job because firms hold the belief that the long-term unemployed are low-quality workers. In other words, if firms are using unemployment experience as a screening device, then unemployed persons with long unemployment durations are perceived as less promising candidates. Also, the longer the unemployment duration, the more discouraged the worker will become and the more likely the agent is to drop out of the labour force.

2) Insider-outsider theory.

This is concerned with the loss of the influence on wage formation by the long-term unemployed. The so-called insiders (incumbent workers) possess market power in determining wages independently of the unemployment in the economy. The market power of the insiders is due to high labour turnover costs, which make it costly for firms to replace an insider by an outsider (an unemployed worker). This allows unions to influence wage determination. Insider-Outsider models are based not on human capital but on the differentiation between insiders and outsiders in a wage bargaining context (see Blanchard et al. 1986 for an exposition).

3) The capital stock theory.

An adverse demand shock leads to a reduction in firms' capital stock. Firms may close plants or scrap capital (firms reaching the shut down point on their respective marginal cost function where, given the price, the marginal cost is lower than the average variable cost). This will cause unemployment to persist because firms can not suddenly open their plants, once the shock is removed and product demand increases.

4) Sectoral Shifts as an additional mechanism for generating persistence. ** Incomplete **

5 Evidence of persistence in the labour market

There does not exist a consensus on the definition and evidence of hysteresis. Many papers tested whether hysteresis is present in Canada, the U.S.A. and in many European countries. A selective review of the literature follows and for each the definition used is reported.

Gordon (1989) used a simple version of a reduced-form equation. Formally, the underlying model was $\pi_t = \alpha\pi_{t-1} + \beta(U_t - U_t^*)$, where π is the inflation rate, U is the level of unemployment and U^* is the natural rate of unemployment (or the NAIRU) obtained for the steady-state $\pi_t = \pi_{t-1}$. To add hysteresis, the model was amended by the equation, $U_t^* = \eta U_{t-1} + \gamma Z_t$. Inserting the latter equation in the former one yields, $\pi_t = \alpha\pi_{t-1} + \beta(1-\eta)U_t + \beta\eta\Delta U_t - \beta\gamma Z_t$, where Δ denotes the difference operator and Z_t refers to a set of structural variables. Gordon defined full hysteresis as the case of $\eta = 1$, and persistence as $\eta < 1$. This study concluded that no evidence of full hysteresis was found in five countries (France, Germany, USA, Japan and U.K.) for the time period 1873-1986.

Fortin (1989, 1991) tested for the presence of hysteresis in Canadian data covering the period from 1957 to 1990. By adding and modeling expected inflation, Fortin was able to undertake a more accurate test for hysteresis. The Phillips curve tested was $\pi_t = \alpha_1\pi_{t-1} + \alpha_2\pi_t^e + \beta[(1-\eta)U_t + \eta\Delta U_t] - \beta\gamma Z_t$, where π_t^e denotes expected inflation. Fortin defined positive hysteresis as $\eta < 0$ and negative hysteresis as $\eta > 0$. The cases of $\eta = 0$ and $\eta = 1$ are no hysteresis and full hysteresis, respectively. Fortin (1991) reported the presence of negative hysteresis for the data from 1957 to 1972. Positive hysteresis was detected for the data covering the period from 1973 to 1990. Full hysteresis was not rejected for the latter period. Fortin pointed to the Canadian unemployment insurance benefits, productivity slowdown, and union density as possible sources for hysteresis.

Graafland (1991) reported that the labour market in the Netherlands in the 1980s was characterized by a high and persistent level of unemployment. The long-term unemployed made up more than 50 percent of total unemployment. This study investigated the relevance of the duration and insider-outsider theories in explaining hysteresis in the Netherlands. It used a small macro labour market model - consisting of four equations (Graafland (1991), p. 157) describing the dynamics of wages, employment, long-term unemployment and vacancies - and estimated it using 2SLS for 1960-1987. The endogenous variables were: number of vacancies, real wage (deflated by consumer prices), labour demand (employment plus vacancies), long-term employment (over one year), actual employment and short-term unemployment. The exogenous variables were: the ratio of value added prices of firms to consumer prices, labour productivity, the rate of income taxes and social transfers (as a fraction of wage costs), the labour force, the replacement ratios of short-term and long-term unemployed, the real value added of firms and a time trend. This study found evidence of duration effects after 1982 in the data. Lopez et al. (1996) reported that monthly unemployment in Spain was consistent with an insider-outsider model and hysteresis.[8] The data in this study was monthly, from 1977:6 to 1994:10.

Measuring shock persistence in time series can be divided into two major approaches. The first is the 'unit root' approach presented by Nelson and Plosser (1982). Such an approach was heavily criticized regarding the low power of unit root tests and the failure to test for structural breaks. Most importantly, using Bayesian analysis, DeJong and Whiteman (1991) reversed the Nelson and Plosser results. The second approach is to use the Beveridge-Nelson decomposition to assess the relative importance of the transitory and the permanent component in the time series. In empirical terms, it amounts to estimating an unrestricted low-order ARIMA.

Recently, Nott (1996) did not find evidence of hysteresis in Canadian data. Yet, a non-linear Phillips curve was not rejected. The method followed Fortin (1991) in testing for the presence of hysteresis by estimating a linear Phillips curve equation. The data covered the period from 1954 to 1995. Nott's results contradicted Fortin's findings of hysteresis and showed how sensitive the latter's results were to the sample period used.

Jones (1995) investigated the hysteresis hypothesis in Canadian data at the microeconomic and macroeconomic level. He concluded that the overall picture is not one of hysteresis, but did not rule out the presence of persistence (dependence) in unemployment rates.

[8] Hysteresis is defined as in Blanchard and Summers (1986).

Wilkinson (1997) investigated the hysteresis hypothesis in Canadian data using the Labour Market Activity Survey (LMAS). Defining hysteresis as irreversibility in the change of the unemployment rate and by testing evidence of negative duration dependence in unemployment spells, the study concluded that there is evidence of hysteresis at the micro level of the data. Wilkinson attributed the evidence of hysteresis to the loss of skills hypothesis of human capital (the human capital view is in subsection 4). The intuition is that prolonged periods of unemployment erode the skill level of the unemployed which decreases the probability of exiting the unemployment spell and finding a job. Therefore, unemployment spells will exhibit negative duration dependence.[9] Using the LMAS data, single-risk[10] hazard rates were estimated, then aggregated to estimate hysteresis at the macro level. The study concluded that hysteresis accounts for three percent to eight percent of the Canadian unemployment rate. This small upperbound points to the difficulty of estimating hysteresis in the aggregate data.

However, Heckman and Singer (1984) argued that negative duration dependence of exit rates in the data is by no means a signal of persistence. They examined econometrically the negative duration dependence view and showed that the existence of two types of jobs, good and bad (i.e., using the dual labour market theory), creates unobserved heterogeneity in aggregate unemployment data. This heterogeneity will always bias the estimated hazards towards negative duration dependence. Therefore, negative duration dependence might be a signal of unobserved heterogeneity and not of persistence in the data.

Hence, while there is no consensus on the definition of hysteresis, empirical evidence of the existence of hysteresis (each author with a distinct definition) is mounting.

6 Definition

We define 'economic persistence' as the 'effect of the shock felt for a minimum period of two years'. We assume that following a shock, a system that exhibits persistence will return to its steady state after a period of two years.

[9] Negative duration dependence means that the probability that a spell will end shortly decreases as the spell increases in length (Kiefer 1988, p. 652, and Lancaster 1990, p. 9, figure 1.1.(b) p. 10 and p. 39).

[10] Single-risk hazard rates occurs when no distinction between transition to work or transition to out of the labour force is made.