

---

# The Propagation of Macroeconomic Shocks: A Dynamic Model with Contracts and Imperfect Competition

Jean-Pascal Bénassy

CNRS and CEPREMAP-ENS, 48 Boulevard Jourdan, 75014 Paris, France.  
jean-pascal.benassy@cepremap.cnrs.fr

**Summary.** In order to study rigorously the propagation of macroeconomic shocks, we construct a dynamic model with wage and price staggering, where wage and price contracts are set by fully maximizing agents in a framework of imperfect competition. We derive the optimal values for wage and price contracts and compute closed form solutions to the resulting dynamics. We show that wage and price contracts of reasonable durations can create persistence and a hump in the response of both output and inflation to monetary shocks.

**Key words:** Persistence, Staggered wages, Staggered prices, Imperfect competition.

**JEL codes:** E32, E52

## 1 Introduction

The purpose of this article is to construct a dynamic general equilibrium model including staggered wage and price contracts, as well as imperfect competition. We will study with it the issue of the propagation of macroeconomic shocks, and notably whether one can obtain a response to monetary shocks similar to that observed in reality. On the empirical side, a number of recent studies have shown that both output and inflation display a persistent response to monetary shocks. Moreover this response seems to be humpshaped, first increasing, then decreasing (see, for example, Cogley and Nason [9]; Christiano, Eichenbaum and Evans [8]). On the other hand RBC type models have often had problems creating such a response to monetary shocks. Recently wage and price contracts<sup>1</sup> have been introduced in that line of models, in order notably to make the corresponding economies more responsive to monetary shocks, and a debate has developed as to whether such modeling would allow to obtain a persistent and hump shaped response to these shocks. Surprisingly

---

<sup>1</sup>In line with the initial works by Gray [12], Fischer [11], Phelps and Taylor [16], Phelps [15], Taylor [17, 18] and Calvo [6].

the answers are widely divergent. For example, Chari, Kehoe and McGrattan [5] conclude that there will be no persistence with reasonable values of the parameters, while Collard and Ertz [10] obtain a hump-shaped and persistent response with one or two years wage contracts<sup>2</sup>. The objective of this article is to investigate the matter analytically, which seems particularly useful in view of the conflicting answers indicated above. For that purpose we shall build a rigorous dynamic stochastic general equilibrium model with *both* price and wage contracts<sup>3</sup>, solve it analytically and express the dynamics of output and inflation as a function of the fundamental underlying parameters. The reason why we study wage and price contracts together, and not in isolation, is that this appears to be instrumental in obtaining a hump-shaped response in both output and inflation, as we shall see below. We shall see that a persistent and humpshaped response of both output and inflation to monetary shocks can be obtained with reasonable parameters.

## 2 The Model

### 2.1 Markets and Agents

The economy studied is a monetary economy with markets for goods, at the (average) price  $P_t$  and markets for labor, at the (average) wage  $W_t$ . The goods and labor markets function under a system of imperfectly competitive labor contracts, which will be detailed below. There are firms and households. Let us begin with the production side. The output index  $Y_t$  is an aggregate of a continuum of output types, indexed by  $i \in [0, 1]$ :

$$\text{Log} Y_t = \int_0^1 \text{Log} Y_{it} di \quad (1)$$

Each index  $Y_{it}$  is itself the aggregate of another infinity of output types indexed by  $k$ :

$$Y_{it} = \left( \int_0^1 Y_{ikt}^\theta dk \right)^{1/\theta} \quad (2)$$

One should think of the index  $i$  as representing sectors, while the index  $k$  refers to firms in these sectors. Quite naturally the substitutability is higher within sectors than across sectors. The representative firm has a Cobb-Douglas technology<sup>4</sup>:

$$Y_{ikt} = Z_t N_{ikt}^\alpha \quad (3)$$

---

<sup>2</sup>Other contributions along the same lines are found, for example, in Ambler, Guay and Phaneuf [1], Andersen [2], Ascari [3], Jeanne [13] and Yun [19].

<sup>3</sup>Microfounded dynamic models with one rigidity and analytical solutions are found in Jeanne [13] for price contracts, and in Ascari [3] and Bénassy [4, 5] for wage contracts. Andersen [2] compares the two types of contracts.

<sup>4</sup>Although capital could be introduced explicitly (cf. for example Bénassy [4]), we omit it here because it complicates substantially the exposition, and does not add much to the dynamics because of the low actual depreciation rate.