Nominal Wage Contracts as a Commitment against Hyperbolic Discounting

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July 2010
Economic agents with hyperbolic discount functions display time inconsistent preferences. In this paper, I show that for such agents fixed nominal wage contracts may represent a welfare enhancing commitment mechanism.
Nominal rigidities are essential in explaining empirical macro facts

**BUT**

micro-founded explanations of nominal rigidities remain controversial

e.g. menu costs, money illusion, asymmetric information
Motivations

1. Nominal rigidities are essential in explaining empirical macro facts.
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2. Hyperbolic discounting is supported by strong experimental evidence.
1. Nominal rigidities are essential in explaining empirical macro facts. **BUT** micro-founded explanations of nominal rigidities remain controversial, e.g., menu costs, money illusion, asymmetric information.

2. Hyperbolic discounting is supported by strong experimental evidence.

3. Graham and Snower (JMCB 2008) show that in a model with hyperbolic discounting and nominal wage contracts, the long-run Phillips curve is significantly downward sloping.
Hyperbolic Discounting?

Choose between the following prospects:

A £ 50 today

B £ 100 on 25th May 2012

Choose between the following prospects:

A £ 50 on 25th May 2015

B £ 100 on 25th May 2017

Most people in experimental trials choose A in the first experiment and B in the second. Their choices are time inconsistent.
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Hyperbolic Discounting

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Most people in experimental trials choose A in the first experiment and B in the second.

Their choices are time inconsistent
Exponential discounting:
Discount factor $= e^{kt}$

Hyperbolic discounting:
Discount factor $= \frac{1}{1+kt}$
Present Value of Future Rewards

Exponential Discounting
Present Value of Future Rewards

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Present Value of Future Rewards

Hyperbolic Discounting
‘The interaction of staggered nominal contracts with hyperbolic discounting leads to inflation having significant long-run effects on real variables’
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- Marginal utility of consumption:
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- Marginal utility of consumption:
- Marginal disutility of labour:
Employment cycling effect
1. Employment cycling effect

2. Discounting effect
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2. Discounting effect

- Under exponential discounting, the first effect dominates
1. Employment cycling effect

2. Discounting effect

- Under exponential discounting, the first effect dominates
- Under hyperbolic discounting, the second effect dominates
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Nominal rigidities lead to higher labour supply in a model with hyperbolic discounting and positive inflation.

Therefore, fixed nominal wage contracts may be optimal if they enable agents to commit their future selves to a higher labour supply.
The Model

- Dynamic general equilibrium model (no stochastics)
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- Monopolistically competitive labour market, perfectly competitive goods market

Quasi-hyperbolic discounting:
\[ \text{Discount factor } = \beta \delta^t > 0 \]

Households can choose whether to supply their labour:
(a) flexibly,
(b) according to a binding fixed real wage contract,
(c) according to a binding fixed nominal wage contract.
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  - (b) according to a binding fixed real wage contract,
  - or (c) according to a binding fixed nominal wage contract.
The representative firm faces a Dixit-Stiglitz (1977) production technology:

\[ y_t = \left[ \int_{h=0}^{1} l_t(h) \frac{\theta - 1}{\theta} \, dh \right]^\frac{\theta}{\theta - 1} \]

The firm’s cost minimisation implies that each household faces the following demand for its labour service:

\[ l_t(h) = w_t(h)^{-\theta} y_t, \]

where \( w_t(h) \) is the real wage set by household \( h \).
The Model: Household Decisions

Each household, $h$, maximises its inter-temporal utility subject to its budget constraint and demand for its labour:

$$\begin{align*}
\text{Max}_{c_t, l_t, B_{t+1}} & \quad U_t(h) = \ln(c_t) - \frac{l_t^{1+\eta}}{1 + \eta} + \beta \sum_{i=1}^{\infty} \delta^i \left[ \ln(c_{t+i}) - \frac{l_{t+i}^{1+\eta}}{1 + \eta} \right] \\
\text{subject to} & \quad c_s + \frac{B_{s+1}}{P_s} = w_s l_s + \frac{T_s}{P_s} + \frac{R_s B_s}{P_s} \\
& \quad l_s = w_s^{-\theta} y_s
\end{align*}$$
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- We must, therefore, model the choices of an individual household as a strategic game between successive incarnations of that household - its present and future selves.
The Model: Labour Supply

Solving this intra-household game under each possible contracting option gives labour supply, consumption and savings choices:

(a) flexible wage setting:

\[ w_t = \frac{\theta}{\theta - 1} \frac{l_t^\eta}{\lambda_0} \]

N.B. Numerator = marginal disutility of labour, discounted hyperbolically
Denominator = income, discounted exponentially
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\[ w^* = \frac{\theta}{\theta - 1} \frac{l_t^{1+\eta} + \beta \sum_{i=1}^{\infty} \delta^i l_{t+i}^{1+\eta}}{\sum_{i=0}^{\infty} \lambda_i l_{t+i}} \]

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  i.e. another game to solve
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- Role of government: exogenous inflation rate  
  OR endogenise government as an active player in the game