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On the Consistency of Money Illusion in New Keynesian Models*

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Abstract

This paper compares alternative ways of modeling money illusion in New Keynesian frameworks. We examine nominal consumption in utility, real-wage misperception, and inflation misperception under labor-augmenting technological growth. The first two approaches generally introduce direct dependence on the price level or require additional preference normalizations to preserve the benchmark balanced-growth path. Modeling money illusion as misperception of current and expected inflation preserves the standard growth structure while generating wedges in labor supply and intertemporal demand. Inflation misperception provides a tractable benchmark for future quantitative macroeconomic analysis.

Keywords: Money Illusion; Inflation misperceptions; New Keynesian models

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1 Introduction

Money illusion has long been discussed as a source of real effects of nominal variables since Fisher (1928). Recent studies incorporate money illusion into dynamic general equilibrium models using several alternative formulations, including those of Miao and Xie (2013); Vaona (2013); Tamegawa (2024); Nutahara (2026); Nutahara and Shirai (2026).

However, the implications of these formulations for model consistency have not been systematically compared. In particular, some specifications may fail to admit the benchmark balanced-growth path of otherwise standard New Keynesian models, or place the price level directly in household optimality conditions.

This paper compares three approaches to money illusion within a common New Keynesian framework with labor-augmenting technological growth: nominal consumption in utility, real wage misperception, and inflation misperception. We show that the first two approaches generally require additional restrictions or preference normalizations to preserve the benchmark balanced-growth path. Modeling money illusion as misperception of current and expected inflation preserves the standard growth structure while generating wedges in labor supply and intertemporal demand. These results show that balanced-growth consistency imposes nontrivial restrictions on how money illusion can be modeled.

The remainder of the paper is organized as follows. Section 2 presents the common environment. Section 3 studies nominal consumption in the utility function. Section 4 examines real wage misperception. Section 5 considers inflation misperception. Section 6 concludes.

2 Common Environment

We focus on the household-side modeling of money illusion. The firm side and monetary policy are kept standard throughout the paper. To compare alternative specifications in a common framework, we consider a growing New Keynesian economy with labor-augmenting technological progress.

Technology evolves according to

$$A_t = A_0(1+z)^t, \tag{1}$$

where $A_0 > 0$ is the initial level of technology and $z \geq 0$ is the constant growth rate of productivity.

Production is linear in effective labor:

$$Y_t = A_t L_t, \tag{2}$$

where Y_t denotes output and L_t labor input.

Let the real wage be defined by

$$w_t \equiv \frac{W_t}{P_t}, \tag{3}$$

where W_t denotes the nominal wage rate and P_t the price level.

Since labor is the only input, real marginal cost is

$$MC_t = \frac{w_t}{A_t}. \tag{4}$$

Gross inflation is defined as

$$\Pi_t \equiv \frac{P_t}{P_{t-1}}. \tag{5}$$

Under standard Calvo pricing, the New Keynesian Phillips curve is

$$\pi_t = \beta E_t \pi_{t+1} + \lambda mc_t, \tag{6}$$

where lowercase letters denote log deviations from balanced-growth values.

The central bank sets the nominal interest rate according to the Taylor rule:

$$\log R_t^n = \log \bar{R}^n + \phi_\pi \pi_t + \phi_y y_t, \tag{7}$$

where R_t^n is the gross nominal interest rate.

The resource constraint is

$$Y_t = C_t, \tag{8}$$

where C_t denotes consumption.

Along the standard balanced-growth path, output, consumption, and the real wage grow in proportion to productivity. Accordingly, define the detrended variables by

$$\tilde{Y}_t \equiv \frac{Y_t}{A_t}, \tag{9}$$

$$\tilde{C}_t \equiv \frac{C_t}{A_t}, \tag{10}$$

$$\tilde{w}_t \equiv \frac{w_t}{A_t}. \tag{11}$$

These variables, together with labor input and real marginal cost, are stationary along the balanced-growth path. These benchmark properties provide the reference point for evaluating whether alternative formulations of money illusion preserve the standard balanced-growth structure.

3 Nominal Consumption in the Utility Function

We first consider a specification in which households value nominal consumption expenditure. The utility function is

$$U = E_t \sum_{t=0}^{\infty} \beta^t \left\{ \frac{\left[(P_t C_t)^{\eta} C_t^{1-\eta} \right]^{1-\sigma} - 1}{1-\sigma} - \varphi \frac{L_t^{1+\chi}}{1+\chi} \right\}, \tag{12}$$

where $\beta \in (0,1)$ is the discount factor, $\sigma > 0$ is the coefficient of relative risk aversion, χ is the inverse of the Frisch elasticity of labor supply, η measures the degree of money illusion, and $\varphi > 0$ is the coefficient on labor disutility. Related formulations appear in Shafir et al. (1997) and Miao and Xie (2013).

The household budget constraint is

$$P_t C_t + B_t = W_t L_t + R_{t-1}^n B_{t-1} + D_t, \tag{13}$$

where B_t denotes end-of-period nominal bond holdings and D_t firm dividends. The Euler equation is

$$C_t^{-\sigma} = \beta E_t \left[\frac{C_{t+1}^{-\sigma} R_t^n}{\Pi_{t+1}^{1-\eta(1-\sigma)}} \right], \tag{14}$$

where $\Pi_{t+1} \equiv P_{t+1}/P_t$ is gross inflation. Money illusion in this setting affects the Euler equation through the term $\Pi_{t+1}^{1-\eta(1-\sigma)}$. The main consistency issue, however, arises from the labor-supply condition. The labor supply condition is

$$\varphi L_t^{\chi} = P_t^{\eta(1-\sigma)} C_t^{-\sigma} w_t, \tag{15}$$

where $w_t = W_t/P_t$ is the real wage. Using $C_t = A_t \tilde{C}_t$ and $w_t = A_t \tilde{w}_t$, this condition can be written as

$$\varphi L_t^{\chi} = P_t^{\eta(1-\sigma)} A_t^{1-\sigma} \tilde{C}_t^{-\sigma} \tilde{w}_t. \tag{16}$$

Along the standard balanced-growth path, $\tilde{C}_t$ and $\tilde{w}_t$ are stationary. Hence the term

$$P_t^{\eta(1-\sigma)} A_t^{1-\sigma} \tag{17}$$

must also be stationary for labor input to remain stationary. In general, this condition is not satisfied. Therefore, the model is not consistent with the standard balanced-growth structure unless additional parameter restrictions are imposed.

The central difficulty is the direct dependence of labor supply on the price level through $P_t^{\eta(1-\sigma)}$. Purely nominal changes in the unit of account therefore affect real allocations. In addition, if $\sigma > 1$, a higher price level lowers labor supply because $\eta(1-\sigma) < 0$. Nominal price increases then reduce labor supply rather than expand it, implying a short-run supply response opposite to the standard New Keynesian mechanism.

Balanced growth can be restored by replacing φ with a time-varying coefficient φ_t proportional to $P_t^{\eta(1-\sigma)} A_t^{1-\sigma}$. Allowing φ_t to depend on productivity is standard in growing models. Allowing it to depend on the price level, however, implies that households' preference for leisure changes with the unit of account, a normalization that is not standard and difficult to justify.

In addition, specifications that place the price level directly in utility may complicate welfare analysis, since purely nominal changes in the unit of account can affect measured utility.

4 Real Wage Misperception

The second approach models money illusion as a misperception of the real wage. In this class of models, households evaluate labor income using a distorted measure of the real wage when choosing labor supply.

4.1 Power Specification

A simple specification is

$$w_t^{MI} = w_t^{\gamma}, \tag{18}$$

where $w_t = W_t/P_t$ is the actual real wage, w_t^{MI} is the perceived real wage, and γ measures the degree of misperception. The case $\gamma = 1$ implies correct perception. This form is used in Vaona (2013). The utility function is

$$U = E_t \sum_{t=0}^{\infty} \beta^t \left\{ \frac{C_t^{1-\sigma} - 1}{1-\sigma} - \varphi \frac{L_t^{1+\chi}}{1+\chi} \right\}. \tag{19}$$

The actual budget constraint is

$$P_t C_t + B_t = W_t L_t + R_{t-1}^n B_{t-1} + D_t. \tag{20}$$

Households make labor supply decisions using the perceived wage. The budget constraint in their optimization problem is therefore written as

$$P_t C_t + B_t = P_t w_t^{MI} L_t + R_{t-1}^n B_{t-1} + D_t + \Omega_t, \tag{21}$$

where Ω_t is a lump-sum adjustment term introduced so that the actual budget constraint continues to hold.

The Euler equation is standard:

$$C_t^{-\sigma} = \beta E_t \left[\frac{C_{t+1}^{-\sigma} R_t^n}{\Pi_{t+1}} \right]. \tag{22}$$

The labor supply condition is

$$\varphi L_t^{\chi} = C_t^{-\sigma} w_t^{MI} = C_t^{-\sigma} w_t^{\gamma}. \tag{23}$$

Using $\tilde{C}_t = C_t/A_t$ and $\tilde{w}_t = w_t/A_t$, we obtain

$$\varphi L_t^{\chi} = A_t^{\gamma-\sigma} \tilde{C}_t^{-\sigma} \tilde{w}_t^{\gamma}. \tag{24}$$

Along the standard balanced-growth path, $\tilde{C}_t$ and $\tilde{w}_t$ are stationary. The benchmark growth structure is preserved only if $\gamma = \sigma$.

Balanced growth can again be restored by replacing φ with a time-varying coefficient φ_t proportional to $A_t^{\gamma-\sigma}$. In that case, however, the required normalization depends on γ, so that preference normalization varies with the degree of wage misperception rather than only standard preference and technology parameters. Such a dependence is not standard in growing macroeconomic models.

4.2 Cobb–Douglas Specification

Another specification combines nominal and real wages:

$$w_t^{MI} = W_t^{\gamma} w_t^{1-\gamma}. \tag{25}$$

The case $\gamma = 0$ implies correct perception, while $\gamma > 0$ places weight on the nominal wage.

The labor supply condition is

$$\varphi L_t^{\chi} = C_t^{-\sigma} w_t^{MI} = C_t^{-\sigma} W_t^{\gamma} w_t^{1-\gamma}. \tag{26}$$

This becomes

$$\varphi L_t^{\chi} = P_t^{\gamma} A_t^{1-\sigma} \tilde{C}_t^{-\sigma} \tilde{w}_t. \tag{27}$$

As in the nominal-consumption specification of Section 3, labor supply depends directly on the price level. Purely nominal changes in the unit of account therefore affect real allocations.

If $\gamma > 0$, a higher price level raises perceived labor income and increases labor supply. Nominal price increases then expand labor supply through money illusion, introducing a supply mechanism driven by the price level itself.

As in the previous section, both A_t and P_t can be removed from the labor supply condition by replacing φ with a time-varying coefficient φ_t proportional to $P_t^{\gamma} A_t^{1-\sigma}$. Allowing this coefficient to vary with productivity is common in growing models. Allowing it to vary with the price level implies that households' preference for leisure changes with the unit of account, a normalization that is not standard and difficult to justify.

5 Inflation Misperceptions

We now consider a specification in which money illusion is modeled as misperception of inflation rather than misperception of levels. Unlike the previous sections, this approach does not place the price level directly in household preferences or labor-income perceptions. It is consistent with the standard balanced-growth structure.

We distinguish between misperception of current inflation and misperception of expected future inflation.

5.1 Perceived Inflation

Households observe the previous-period price level P_{t-1}, but may misperceive current inflation,

$$\Pi_t \equiv \frac{P_t}{P_{t-1}}, \tag{28}$$

according to

$$\Pi_t^{MI} = (\Pi^*)^{\psi_c} \Pi_t^{1-\psi_c}, \tag{29}$$

where $\psi_c \in [0,1]$ measures the degree of current-inflation misperception and Π^* denotes the steady-state gross inflation rate. The case $\psi_c = 0$ implies correct perception.

The perceived current price level is

$$P_t^{MI} = P_{t-1} \Pi_t^{MI}. \tag{30}$$

Households may also misperceive expected future inflation:

$$E_t \Pi_{t+1}^{MI} = (\Pi^*)^{\psi_f} \left(E_t \Pi_{t+1}\right)^{1-\psi_f}, \tag{31}$$

where $\psi_f \in [0,1]$ measures the degree of expected-inflation misperception. The case $\psi_f = 0$ implies correct perception.

5.2 Household Problem

The actual budget constraint is

$$P_t C_t + B_t = W_t L_t + R_{t-1}^n B_{t-1} + D_t. \tag{32}$$

Households make decisions using perceived inflation. Their subjective budget constraint is

$$P_t^{MI} C_t + B_t = W_t L_t + R_{t-1}^n B_{t-1} + D_t + \Omega_t, \tag{33}$$

where Ω_t is a lump-sum adjustment term that reconciles the perceived and actual budget constraints.

Preferences are standard:

$$U = E_t \sum_{t=0}^{\infty} \beta^t \left[\frac{C_t^{1-\sigma} - 1}{1-\sigma} - \varphi \frac{L_t^{1+\chi}}{1+\chi} \right]. \tag{34}$$

The labor supply condition is

$$\varphi L_t^{\chi} = C_t^{-\sigma} \frac{W_t}{P_t} \left(\frac{\Pi_t}{\Pi^*} \right)^{\psi_c}. \tag{35}$$

The Euler equation is

$$C_t^{-\sigma} = \beta E_t \left[C_{t+1}^{-\sigma} \frac{R_t^n}{\Pi_{t+1}^{MI}} \right]. \tag{36}$$

Hence, the perceived real return is given by R_t^n / Π_{t+1}^{MI}. Expected inflation misperception acts as a wedge in the perceived real interest rate and affects intertemporal demand.

The two channels affect different parts of the New Keynesian system: current inflation misperception influences the Phillips curve through marginal cost, whereas expected inflation misperception affects the dynamic IS equation through the perceived real interest rate.

5.3 Balanced-Growth Consistency

The present approach depends on inflation rates rather than the price level itself. If inflation is constant at its steady-state value,

$$\Pi_t = \Pi^*, \tag{37}$$

then

$$\Pi_t^{MI} = \Pi^*, \qquad E_t \Pi_{t+1}^{MI} = \Pi^*. \tag{38}$$

The labor supply condition becomes

$$\varphi L_t^{\chi} = A_t^{1-\sigma} \tilde{C}_t^{-\sigma} \tilde{w}_t. \tag{39}$$

As in the benchmark growing model, the productivity term can be removed by replacing φ with a time-varying coefficient φ_t proportional to $A_t^{1-\sigma}$.

No additional trend term involving P_t or the money-illusion parameters remains in the household first-order conditions. Inflation misperception requires only the usual productivity scaling of labor disutility and does not require auxiliary normalization linked to the price level or to the degree of money illusion.

Recent studies have begun to apply this framework in different directions. Nutahara and Shirai (2026) embed the inflation-misperception specification into a medium-scale DSGE model and show that it improves the empirical fit to Japanese data. Nutahara (2026) applies the same framework to monetary policy with asset-price responses and derives implications for equilibrium determinacy. These results suggest that this specification provides a tractable benchmark for quantitative New Keynesian analysis.

6 Concluding Remarks

This paper compares alternative ways of modeling money illusion in New Keynesian environments.

Nominal consumption in utility and real-wage misperception generally fail to preserve the benchmark balanced-growth path without additional restrictions or auxiliary normalizations. In several cases, formulations that rely directly on the price level may also generate nonstandard real effects of purely nominal changes.

Inflation misperception is compatible with the standard growth structure under the usual productivity scaling of labor disutility. It does not require additional normalization linked to the price level or to the degree of money illusion, while still generating wedges in labor supply and intertemporal demand.

Inflation misperception provides a tractable benchmark for future work on behavioral expectations, estimated DSGE models, and monetary policy analysis.

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