

Optimal Monetary Policy in a Model with Distinct Core and Headline Inflation Rates

Martin Bodenstein, Chris Erceg, and Luca Guerrieri

Federal Reserve Board

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Introduction

- Substantial gap between headline and core inflation has intensified debate over **which inflation measure is the more appropriate focus of policy.**
 - in U.S., headline inflation averaged 3/4 percentage point higher than core over the 2002-2006 period.
- Interest in this issue has been fueled because central banks appear to diverge in the importance they attach to the alternative inflation measures, e.g.:

Introduction (con't)

- Bank of England has an explicit goal for forecast of headline inflation.
- Other central banks appear more concerned with core inflation (forecast or realized).

Our paper develops an analytical framework to address what type of monetary rule is desirable in response to energy shocks that drive a wedge between core and headline inflation.

- Important as an operational guide to policy.
- Facilitating an effective communication strategy.

- Our Approach

- We develop a simple two sector DSGE model that allows a distinction between headline and core inflation.
- Core prices are sticky, reflecting they are set by monopolistically competitive retailers in staggered contracts (Taylor 1980 and Calvo 1983)
- Energy prices are flexible, equating sum of household and firm demand to available supply.
- Sticky wages introduce a stabilization tradeoff.

Our Approach (con't)

- We derive a quadratic approximation to social welfare (following Rotemberg and Woodford 1997), and then:
 - analyze the characteristics of optimal policy in response to both temporary and permanent contractions in energy supply.
 - compare the performance of various suboptimal rules, with emphasis on “forecast-based” rules that respond to core or headline inflation forecasts.

Key results

- Optimal policy response to shock that increases energy price involves persistent rise in core inflation, and fall in wage inflation; hence **rise in core prices plays important role in bringing about required real wage adjustment.**
- Policies that keep output close to potential nearly optimal (similar to Erceg, Henderson, and Levin 2000, and Erceg and Levin 2006).
- “Dual mandate” policies based on an objective that weights both core inflation and output gap volatility also perform well unless there is a unidimensional focus on stabilizing inflation.

Results: Comparing Alternative Forecast Rules

- Rules that respond to forecast of headline vs. core inflation have very different effects if energy price rise perceived as temporary.
- **Headline forecast rule more accommodative:** stabilizing headline means expected fall in energy price must be offset by higher core inflation.
- **Headline forecast rule implies excessive volatility** in core inflation and output gap, and hence performs poorly using social welfare criterion.

Model overview

- Households consume energy and a “core” basket of different retail goods.
- Households are monopolistic competitors in the labor market, and set nominal wages in staggered contracts (four quarter Calvo in benchmark; also consider Taylor contracts).
- Monopolistically-competitive **retailers** purchase a generic wholesale good, and resell it at a markup over marginal cost. Retailers set their price in staggered contracts (four quarter Calvo).

Model overview (con't)

- Wholesale good produced by perfectly competitive firms (“wholesalers”) using labor and energy.
- **Oil market equilibrium:** demand for energy by households and firms must equal available supply (an exogenous shock process).

Households and Wage-Setting

Maximize:

$$E_t \sum_{j=0}^{\infty} \beta^j \frac{\sigma}{\sigma-1} C_{t+j}(h)^{\frac{\sigma-1}{\sigma}} - \frac{\chi_0}{1+\chi} N_{t+j}(h)^{1+\chi},$$

subject to:

$$P_{Nt} C_{Nt}(h) + P_{Ot} O_{Ct}(h) + \int_s \xi_{t,t+1} B_{t+1}(h) = \\ B_t(h) + (1 + \tau_w) W_t(h) N_t(h) + P_{Ot} Y_{Ot} + \Gamma_t(h) - T_t(h).$$

P_{Nt} = price of non-energy, or “core” basket

P_{Ot} = price of energy

Households and Wage-Setting (con't)

Household Technology for Producing Final Consumption Good

$$C_t = \left((1 - \omega_{OC})^{\frac{\rho_o}{1+\rho_o}} C_{Nt}^{\frac{1}{1+\rho_o}} + \omega_{OC}^{\frac{\rho_o}{1+\rho_o}} O_{Ct}^{\frac{1}{1+\rho_o}} \right)^{1+\rho_o},$$

P_{Ct} is the implicit cost of producing a unit of the final consumption good, or “headline” consumer price level.

Complete contingent claims.

Staggered wage setting à la Calvo (EHL), in baseline model, but also consider Taylor contracts.

Production of Retail Goods

Essentially only one non-energy (or core) good Y_{Nt} , but we assume a standard monopolistically competitive framework to account for price stickiness.

The composite good Y_{Nt} is produced by a representative firm that uses individual retail goods $Y_{Nt}(f)$ as inputs:

$$Y_{Nt} = \left[\int_0^1 (Y_{Nt}(f))^{\frac{1}{1+\theta_p}} df \right]^{1+\theta_p} .$$

Production of Retail Goods (con't)

Demand for Retail Goods:

$$Y_{Nt}(f) = \left[\frac{P_{Nt}(f)}{P_{Nt}} \right]^{-\frac{1+\theta_p}{\theta_p}} Y_{Nt}. \quad (1)$$

Individual retailers choose contract price $P_{Nt}(f)$ to maximize discounted profits in staggered contracts setting (Calvo or Taylor).

Production of Wholesale Goods

The wholesale good Y_{Wt} is produced by competitive firms according to the production function:

$$Y_{Wt} = \left((1 - \omega_{op}^{\frac{\rho_o}{1+\rho_o}}) L_t^{\frac{1}{1+\rho_o}} + \omega_{op}^{\frac{\rho_o}{1+\rho_o}} O_{pt}^{\frac{1}{1+\rho_o}} \right)^{1+\rho_o},$$

Each firm sells its output to wholesalers at its marginal cost of production P_{Wt} .

Resource Constraints

Retail goods are produced exclusively for household consumption, so $C_{Nt} = Y_{Nt}$.

The cumulative demand of retailers for the wholesale good must equal the available supply:

$$\int_0^1 Y_{Wt}(f)df = Y_{Wt}.$$

Oil use by households and firms must sum to the endowment:

$$\int_0^1 O_{Ct}(h)dh + O_{pt} = Y_t^O.$$

Welfare Function Approximation

A quadratic approximation to the period loss function of households takes the form:

$$\begin{aligned} \frac{U_t - U_t^*}{U_c \bar{C}} = & -\frac{1(1 + \chi)(1 - \omega_{oc})}{2(1 - \omega_o)} \left[g_t + \omega_o \left(\frac{O_C}{Y^O} \right) \mu_{Pt} \right]^2 \\ & -\frac{1}{2}(1 - \omega_{oc}) \left(\frac{1 + \theta_p}{\theta_p} \right) \text{Var}_f P_t(f) \\ & -\frac{1}{2}(1 - \omega_{oc})(1 - \omega_o) \left(\frac{1 + \theta_w}{\theta_w} \right) \left(1 + \frac{1 + \theta_w}{\theta_w} \chi \right) \text{Var}_h w_t(h). \end{aligned}$$

The loss depends on 1) output gap volatility, 2) price dispersion 3) wage dispersion, 4) misallocation of energy across sectors.

Monetary Policy

We begin by assessing the implications of the full commitment optimal policy that minimizes the utility-based loss function.

We then consider alternative suboptimal rules, including **targeting rules** based on a loss function that depends only on variation in inflation and the output gap: :

$$\mathbb{E}_t \sum_{j=0}^{\infty} \beta^j (\pi_{t+j}^2 + \lambda_g g_{t+j}^2).$$

We also examine the performance of Taylor-type instrument rules:

$$i_t = \gamma_{1f} E_t \pi_{t+1} + \gamma_{2f} E_t \pi_{Ct+1} + \gamma_y (y_t - y_t^*).$$

Figure 3. Contraction in energy supply: Optimal Policy vs. Flexible Price Equilibriu

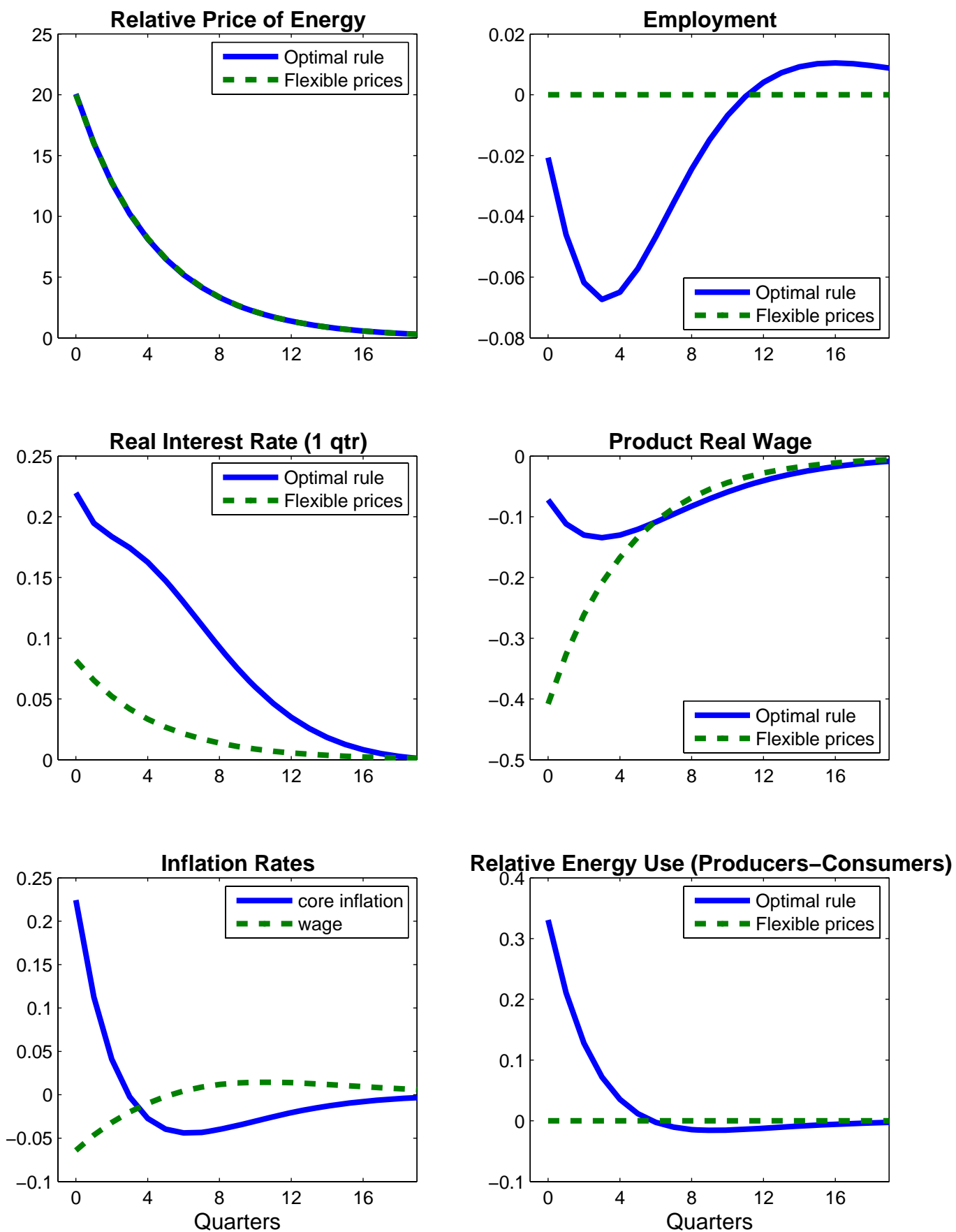


Figure 4. Temporary Fall in Energy Supply: Inflation Targeting Rules

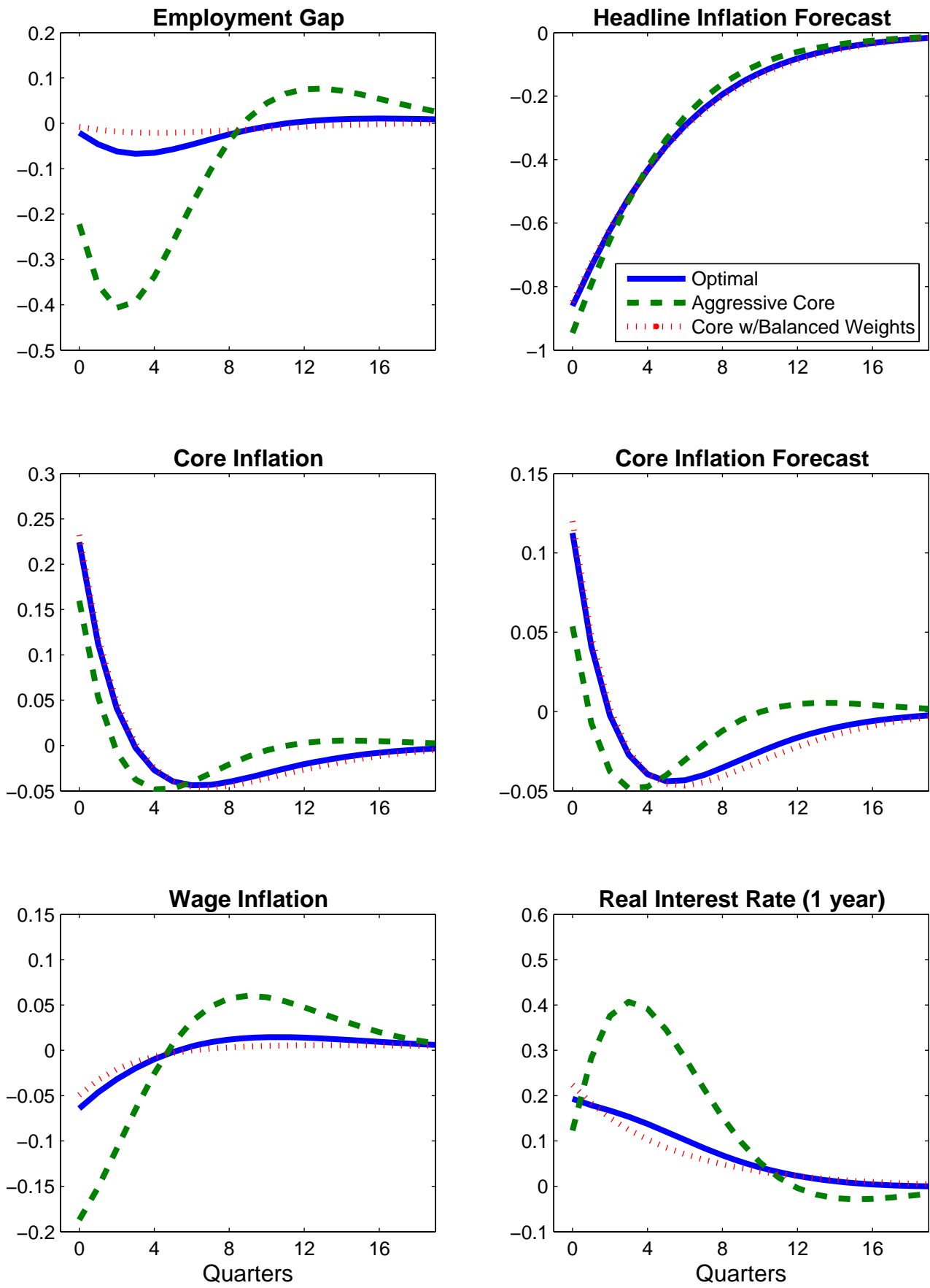


Figure 7. Temporary Fall in Energy Supply: Forecast-Based Taylor Rules

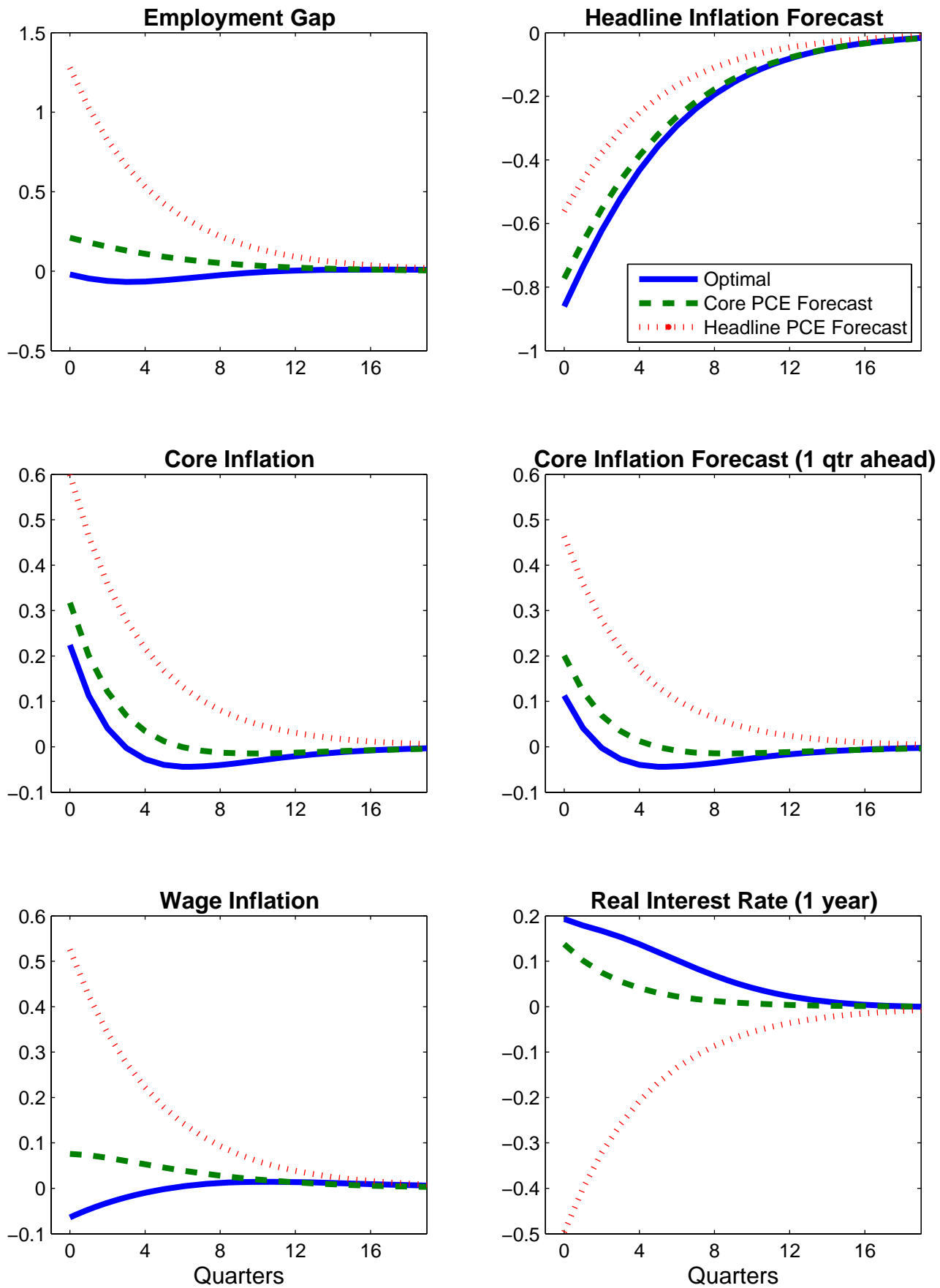


Figure 1: Temporary Fall In Oil Supply, Taylor contracts

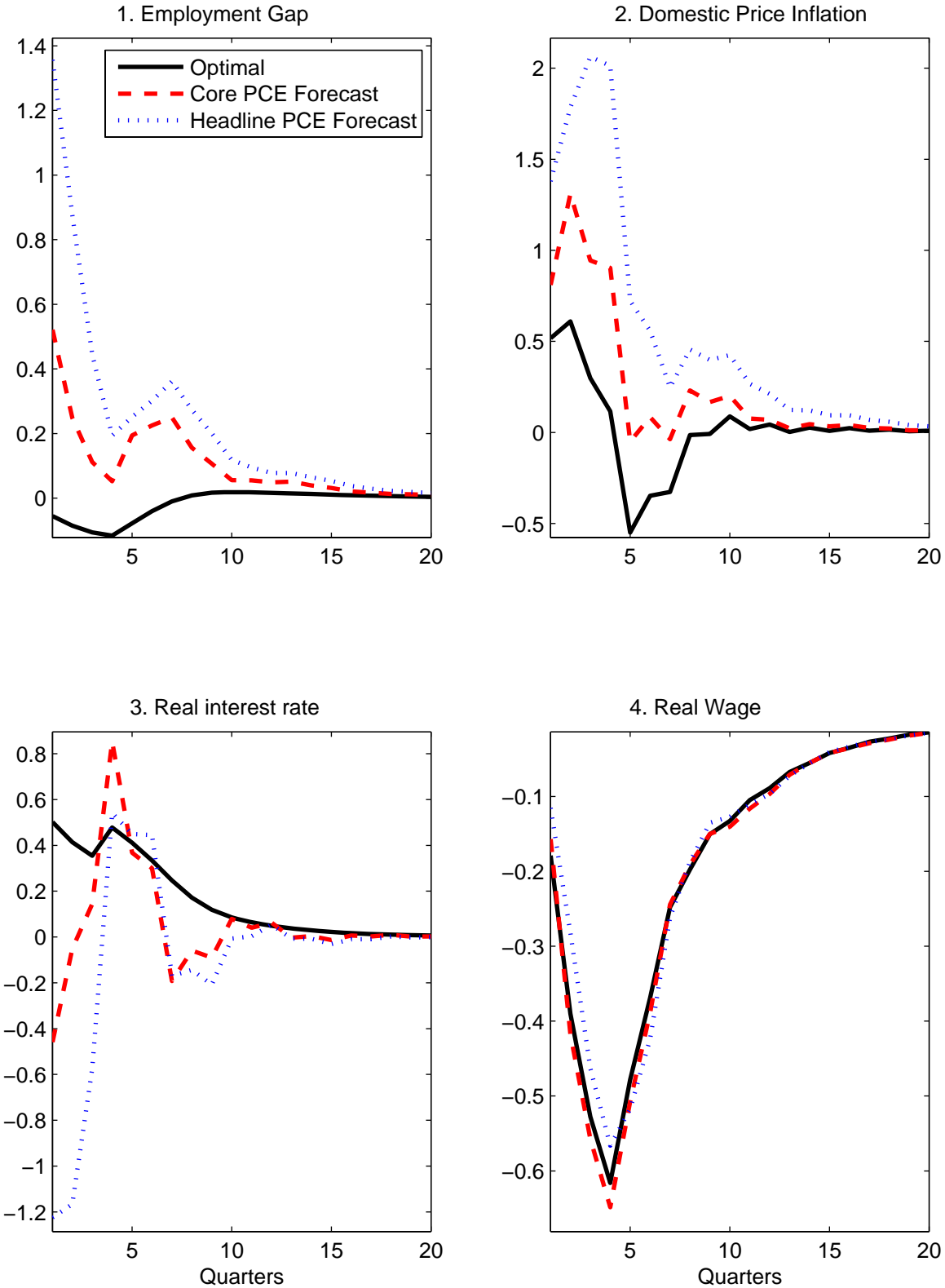


Figure 6: Policy Tradeoff Frontier for Oil Supply Shock

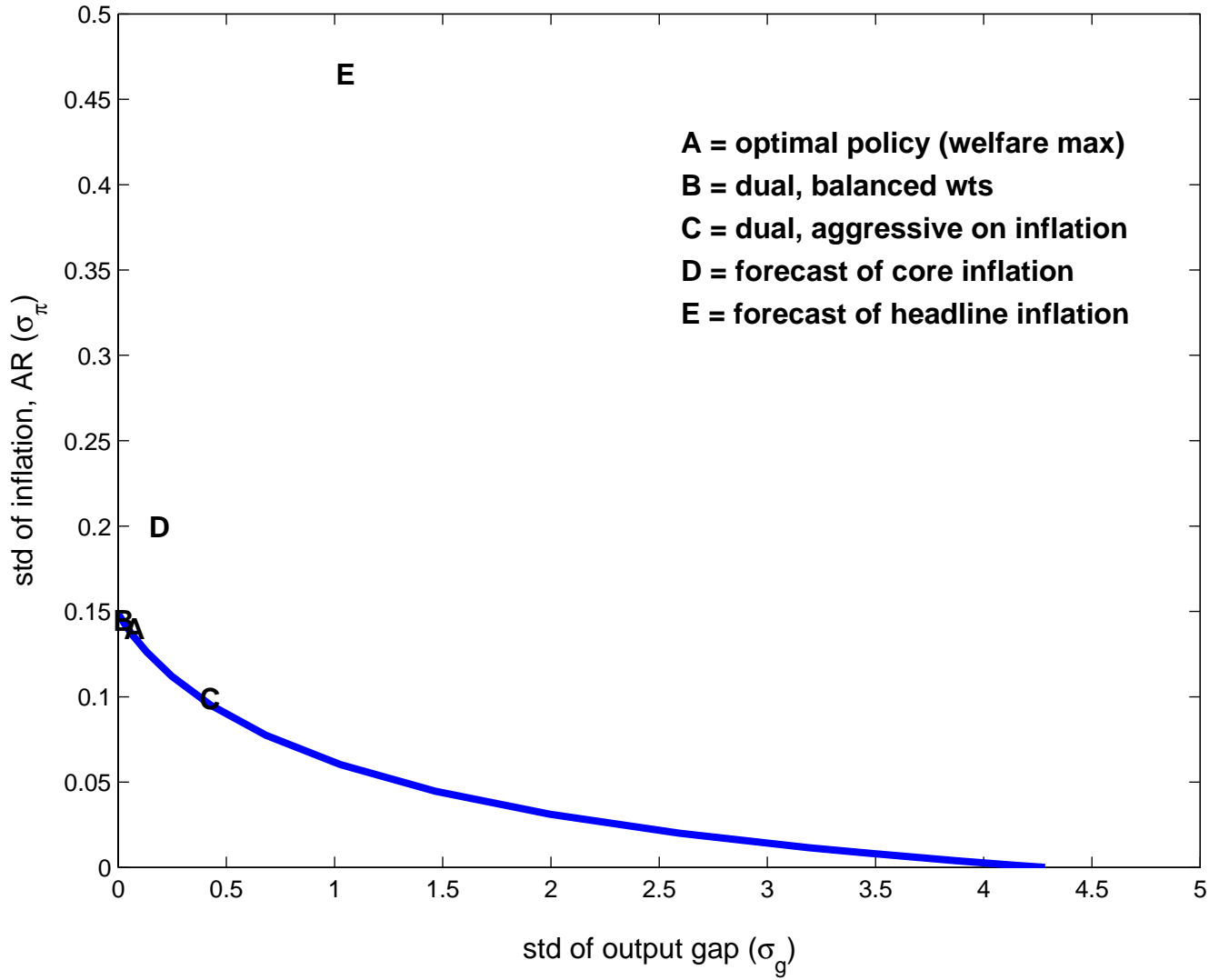
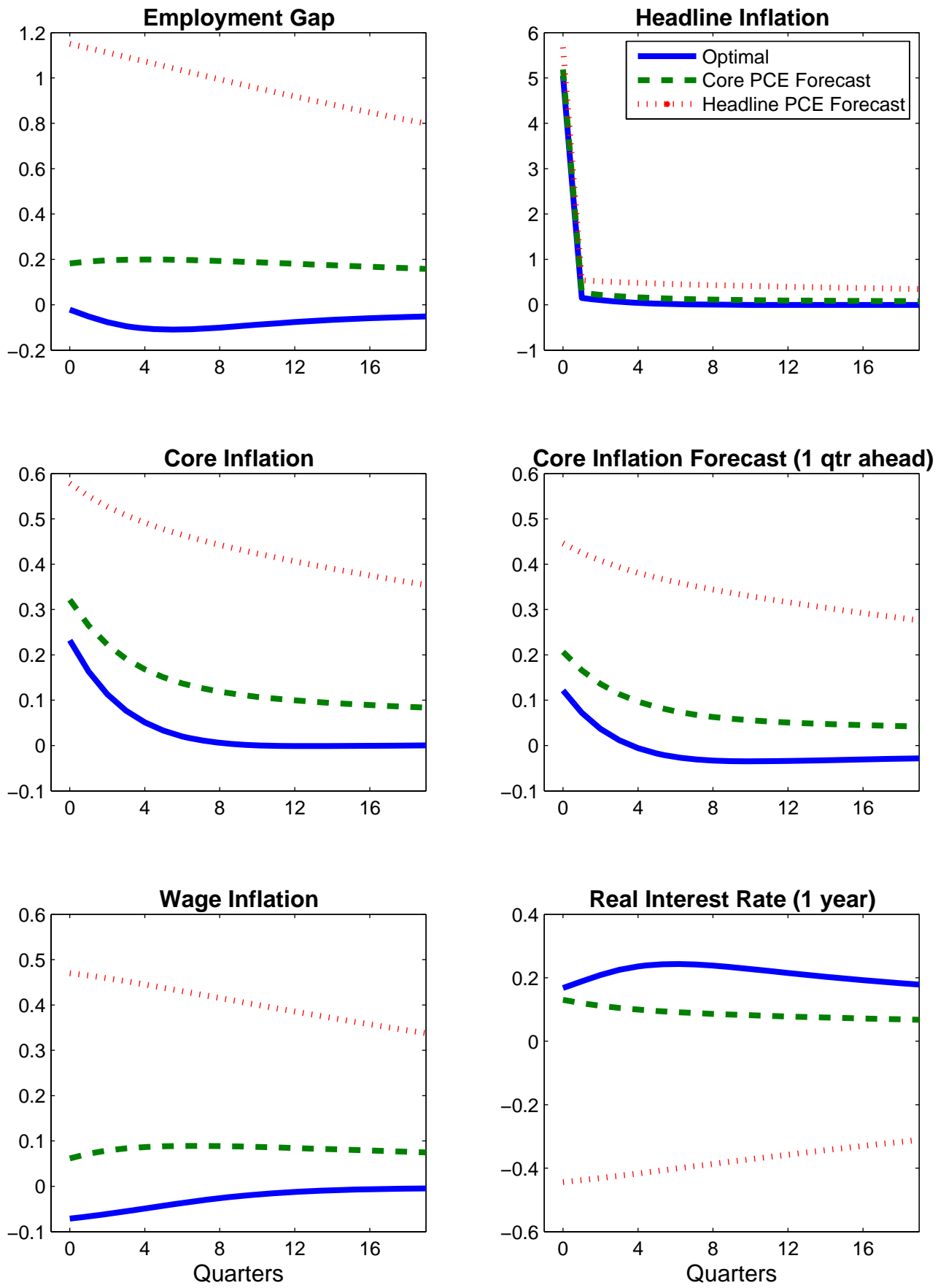


Figure 8. Fall in Energy Supply Perceived as Temporary: Imperfect Information



Conclusions

- **Headline forecast targeting** may pose serious operational policy and communication difficulties:
 - as noted, this policy would require reducing real interest rates in response to a temporary rise in oil prices, notwithstanding that recent headline inflation was high.
 - problems are exacerbated in realistic case in which there is uncertainty about the persistence of the shock.
- Our analysis suggests that dual mandate rules derived from an objective that depends on output gap and core inflation volatility are likely to perform quite well relative to the optimal policy.