

Comments on:

“The New-Keynesian Phillips Curve  
When Inflation Is Non-Stationary:  
The Case of Canada”

by Bergljot Bjørnson Barkbu and Nicoletta Batini

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Presented at the Bank of Canada Economic Conference on “Issues in Inflation Targeting”, Ottawa,  
April 28-29, 2005.

# Contribution of the Paper

- Application of a method by Johansen and Swensen (1999) to the estimation of the hybrid New-Keynesian Phillips Curve (NKPC) for Canada, which allows:
  - detecting stochastic trends in the variables used in the estimation; and
  - testing the restrictions implied by the model under rational expectations.
- Review of the empirical literature on the hybrid NKPC along several dimensions:
  - empirical research focused on estimating variants of the NKPC for Canada;
  - (invalidity of) statistical inference based on standard GMM and FIML methods, when the variables used in the estimation are non-stationary; and
  - (lack of) identification of the weights on lagged and expected inflation.

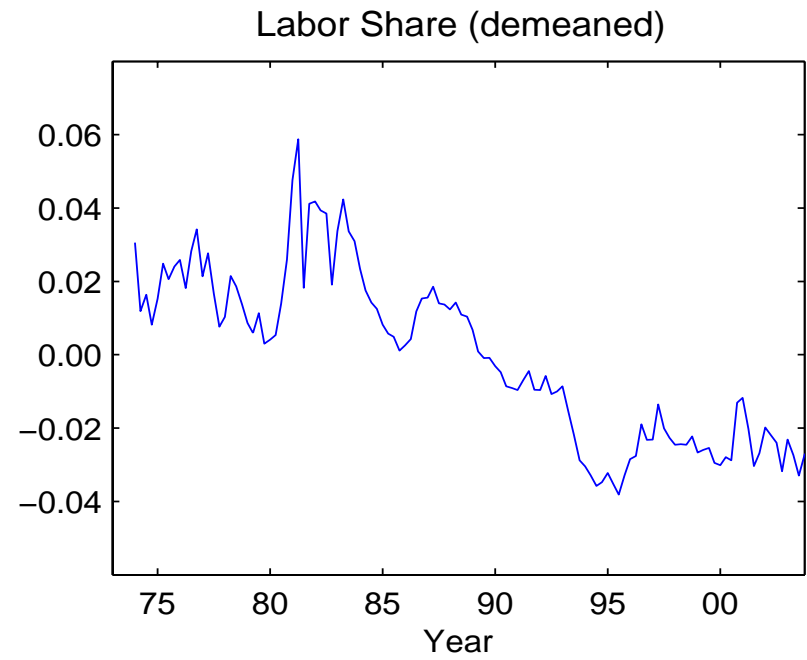
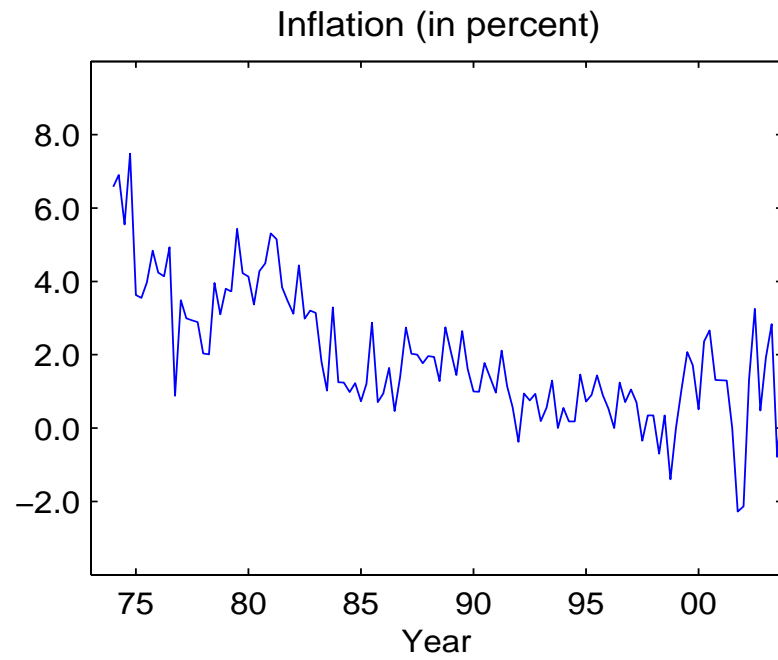
# Main Findings of the Paper

- The hybrid NKPC provides a satisfactory description of Canadian inflation data when proxying real marginal cost by the labor share adjusted for the cost of imported inputs (cf. Batini, Jackson and Nickell, 2005).
  - The estimated weight on expected inflation is relatively high with  $\gamma_f \in [0.714, 0.729]$ .
  - The estimated slope coefficient is surprisingly large and varies substantially depending on the sample period with  $\lambda \in [0.165, 0.415]$ .
- The restriction  $\gamma_b + \gamma_f = 1$  is not rejected.
  - The estimated relationship links changes in inflation and the level of real marginal cost.
  - Hence, with  $d = [0, \lambda]$ , the labor share is found to be stationary, while inflation ought to follow a stochastic trend.
- Adjusting the labor share for indirect taxes and the remuneration of self-employed workers does not yield reasonable results.

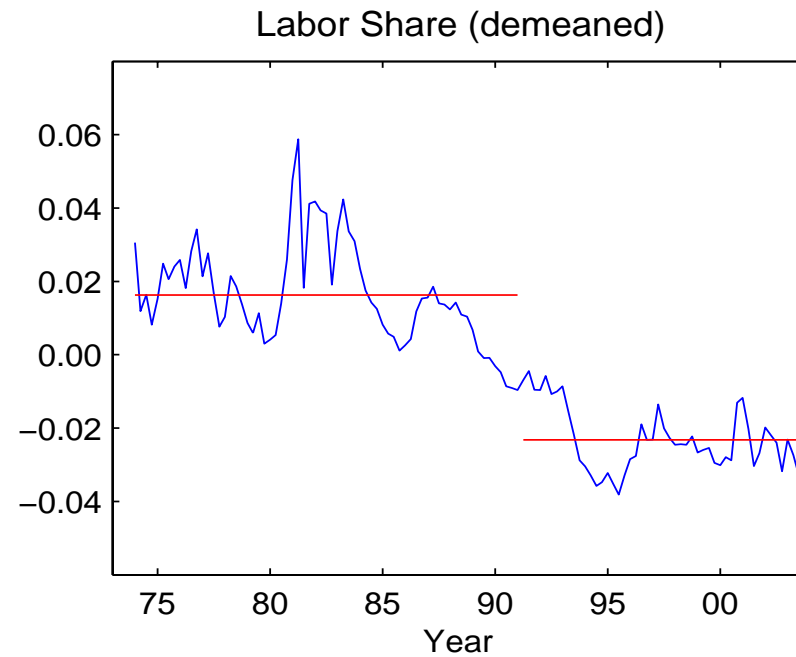
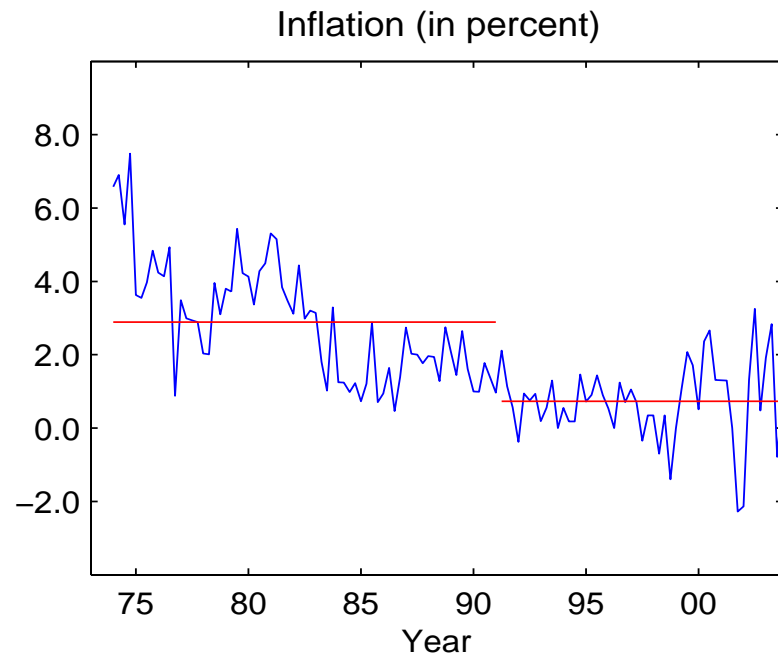
# Focus of My Discussion

- Revisit the empirical evidence on the time-series properties of the variables used in the estimation of the NKPC for Canada.
- Provide some new evidence on Canadian inflation dynamics by estimating a generalized price-setting framework, building on Coenen and Levin (2004).
  - Discern the slope of the price-setting equation in terms of nominal versus real rigidities, which are not separately identified for the NKPC (cf. Galí, Gertler and López-Salido, 2001; Sbordone, 2002; Eichenbaum and Fisher 2004).
  - Investigate whether there is a need to account for backward-looking behavior to explain aggregate data (cf. Galí and Gertler, 1999; Christiano, Eichenbaum and Evans, 2005; Erceg and Levin, 2003).
- Conclude with some general remarks on the importance of accounting for shifts in the monetary policy regime.

# Is Inflation Really Non-Stationary?



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Visual inspection suggests that both inflation and the labor share have become stationary after the move to inflation targeting in 1991.

## Is Inflation Really Non-Stationary? (cont.)

Hypothesis $H_0 : r = p$	Trace Statistic	$p$ -value (asymptotic)	$p$ -value (bootstrapped)
A. Sample Period 1973-2003			
$p = 0$	21.93	0.00	0.01
$p \leq 1$	2.88	0.09	0.38
B. Sample Period 1973-1990			
$p = 0$	13.49	0.10	0.20
$p \leq 1$	4.29	0.04	
C. Sample Period 1991-2003			
$p = 0$	20.63	0.01	0.03
$p \leq 1$	6.36	0.01	0.08

Note: The asymptotic and bootstrap-based  $p$ -values have been computed using the programme Structural VAR, Version 0.34 by Anders Warne, 2001-2005.

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# Aggregate Price-Setting Behavior in Canada, 1991-2003

- Building on Coenen and Levin (2004), consider a generalized Calvo-style price-setting framework that
  - incorporates multiperiod staggered contracts of random duration; and
  - allows identifying the influences of nominal versus real rigidities.
- The framework encompasses two sources of real rigidity:
  - firm-specific inputs (cf. Altig, Christiano, Eichenbaum and Lindé, 2004; Sveen and Weinke, 2003; Woodford, 2004); and
  - non-constant elasticity of demand (cf. Kimball, 1995).
- Estimate this framework by applying a simulation-based indirect inference procedure to Canadian data over the period 1991-2003.

# The Staggered Contracts Model with Random-Duration Contracts

- The price-setting decision of firms can be expressed in log-linearized form as

$$x_t = \mathbf{E}_t \left[ \sum_{i=1}^{J-1} \Phi_i \pi_{t+i} + \gamma \sum_{i=0}^{J-1} \phi_i mc_{t+i} \right],$$

where  $x_t$  denotes the new contract price relative to the aggregate price level and  $(\phi_i, \Phi_i)$  depends on the distribution of price contracts of duration  $j$  with  $\{\omega_j : j = 1, \dots, J\}$ ,  $\omega_j \geq 0$  and  $\sum_{j=1}^J \omega_j = 1$ .

- The aggregate price identity can be expressed in log-linearized form as

$$\sum_{i=0}^{J-1} \psi_i x_{t-i} = \sum_{i=0}^{J-2} \Psi_{i+1} \pi_{t-i}$$

with  $(\psi_i, \Psi_i)$  again depending on the distribution of price contracts.

# Identifying the Sources of Real Rigidity

- The parameter  $\gamma$  determines the sensitivity of the new price to aggregate real marginal cost and can be expressed as the product of two components:

$$\gamma = \gamma_d \cdot \gamma_{mc}$$

which depend on the characteristics of the demand curve faced by price-setting firms and the share of firm-specific inputs (cf. Eichenbaum and Fisher, 2004).

- In the special case with constant elasticity of demand,  $\gamma_d = 1$ .
- In the special case with no firm-specific inputs,  $\gamma_{mc} = 1$ .

## Estimates of Nominal and Real Rigidities, 1991-2003

Distribution of Contract Durations				Mean	Real	
$\omega_1$	$\omega_2$	$\omega_3$	$\omega_4$	Duration	Rigidity ( $\gamma$ )	$p$ -value
0.29	0.49	0.06	0.16	2.09	0.0026	0.09
(0.15)	(0.19)	(0.07)	(0.11)	(0.34)	(0.0014)	

Note: Estimated asymptotic standard errors are given in parentheses; the  $p$ -value refers to the asymptotic test of overidentifying restrictions.

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Finding I: Aggregate price-setting behavior is well characterized by staggered contracts with a mean duration of about two quarters.

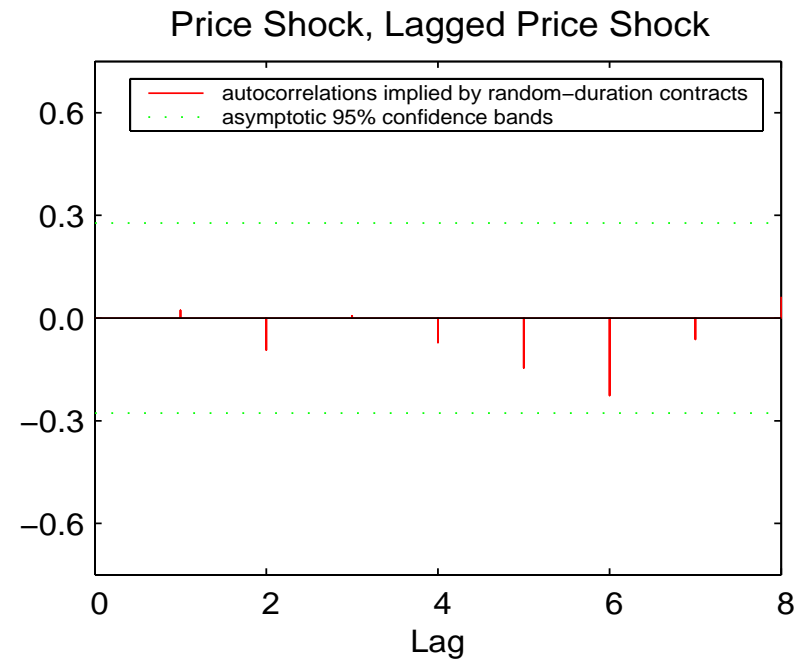
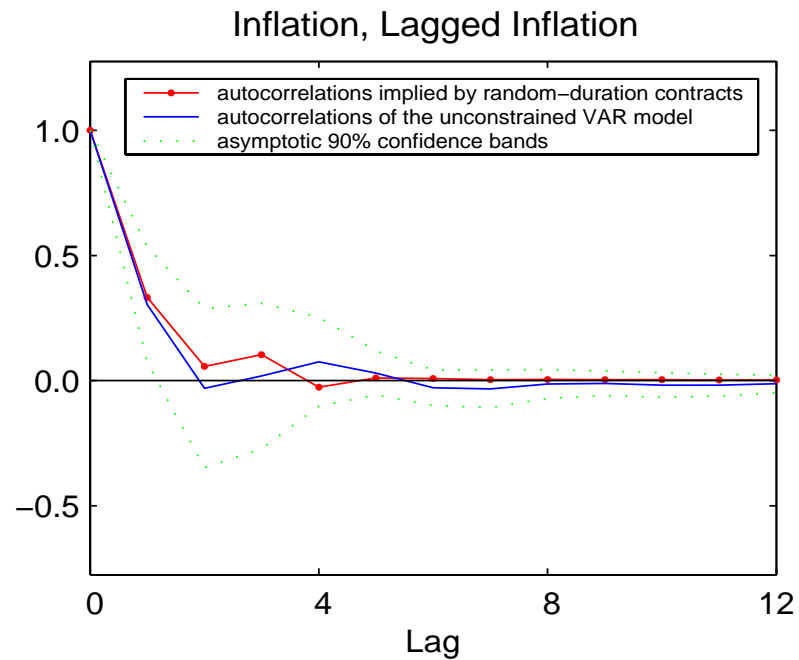
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Finding II: New price contracts exhibit very low sensitivity to real marginal cost, corresponding to a relatively high degree of real rigidity involving both firm-specific inputs and non-constant elasticity of demand.

# Inflation Dynamics and Correlations of Price Shocks, 1991-2003



The estimated model is able to closely match the correlation structure of an unrestricted vector autoregression without including backward-looking elements.

# Conclusion

- Overall, the estimates of the generalized price-setting framework with random-duration contracts confirm the main findings by Bjørnson Barkbu and Batini:
  - Inflation dynamics in Canada is characterized by a high degree of forward-looking price-setting behavior.
  - Indeed, backward-looking price-setting behavior is not needed, at least in the context of a stable monetary policy regime with a transparent and credible inflation objective, as was established by the introduction of inflation targeting in 1991.
- However, further analysis is needed regarding the sensitivity of prices with respect to real marginal cost; that is, the slope of the NKPC.