

Comments on Dorich, Mendes, and Zhang

**The Bank of Canada's "Horse Race" of Alternative
Monetary Policy Frameworks: Some Interim Results**

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**Towards the 2021 renewal of the Bank of Canada's Monetary Policy
Framework: A Discussion on Current Research and Lessons from the
COVID-19 Crisis for Monetary Policy**

What the paper does:

- 4 Models: ToTEM (\pm ELB), HANK, Bounded Rationality
- Instrument, i_t , follows the nominal interest rate feedback rule

$$i_t = 0.85i_{t-1} + (1 - 0.85)i_t^*$$

- 6 Alternative ‘monetary policy frameworks’ (i_t^*)

$$i_t^* = i^* + \gamma(\pi_t^{yy} - \bar{\pi}^a) + \alpha\tilde{x}_t \quad (\text{IT})$$

$$i_t^* = i^* + \gamma(\pi_t^{3y} - \bar{\pi}^a) + \alpha\tilde{x}_t \quad (\text{AIT})$$

$$i_t^* = i^* + \gamma(p_t - \bar{p}_t) + \alpha\tilde{x}_t \quad (\text{PLT})$$

$$i_t^* = i^* + \delta \left[(y_t + p_{y,t}) - (\bar{y}_t + \bar{p}_{y,t}) \right] \quad (\text{NGDP level})$$

$$i_t^* = i^* + \delta \left[\Delta(y_t + p_{y,t}) - \Delta(\bar{y}_t + \bar{p}_{y,t}) \right] \quad (\text{NGDP growth})$$

$$i_t^* = i^* + \gamma(\pi_t^{yy} - \bar{\pi}^a) + \alpha\tilde{u}_t \quad (\text{dual mandate})$$

- How to pick γ , α , and δ ? To minimize an ad hoc loss function:

Table 1: Regime-Specific Delegated Loss Functions and Simple Rules

Framework	Loss specification	Interest rate rules
IT	$L^{IT} = (\pi_t^{yy} - \bar{\pi}^a)^2 + 0.5 (\Delta i_t)^2 + (\tilde{x}_t)^2$	$i_t = i^* + \gamma(\pi_t^{yy} - \bar{\pi}^a) + \alpha \tilde{x}_t$
AIT	$L^{AIT} = (\pi_t^{3y} - \bar{\pi}^a)^2 + 0.5 (\Delta i_t)^2 + (\tilde{x}_t)^2$	$i_t = i^* + \gamma(\pi_t^{3y} - \bar{\pi}^a) + \alpha \tilde{x}_t$
PLT	$L^{PLT} = (p_t - \bar{p}_t)^2 + 0.5 (\Delta i_t)^2 + (\tilde{x}_t)^2$	$i_t = i^* + \gamma(p_t - \bar{p}_t) + \alpha \tilde{x}_t$
NGDP Level	$L^{NGDPL} = \left\{ \begin{array}{l} (y_t + p_{GDP,t}) \\ -(\bar{y}_t + \bar{p}_{GDP,t}) \end{array} \right\}^2 + 0.5 (\Delta i_t)^2$	$i_t = i^* + \delta \left[\begin{array}{l} (y_t + p_{GDP,t}) \\ -(\bar{y}_t + \bar{p}_{GDP,t}) \end{array} \right]$
NGDP Growth	$L^{NGDPG} = \left\{ \begin{array}{l} (\Delta y_t^{yy} + \Delta p_{GDP,t}^{yy}) \\ -(\overline{\Delta y_t^{yy}} + \overline{\Delta p_{GDP,t}^{yy}}) \end{array} \right\}^2 + 0.5 (\Delta i_t)^2$	$i_t = i^* + \delta \left[\begin{array}{l} (\Delta y_t^{yy} + \Delta p_{GDP,t}^{yy}) \\ -(\overline{\Delta y_t^{yy}} + \overline{\Delta p_{GDP,t}^{yy}}) \end{array} \right]$
Unemployment- Inflation Dual Mandate	$L^{DM} = (\pi_t^{yy} - \bar{\pi})^2 + (\tilde{u}_t)^2 + 0.5 (\Delta i_t)^2$	$i_t = i^* + \gamma(\pi_t^{yy} - \bar{\pi}) + \alpha \tilde{u}_t$

- Impressive variety of models and reaction functions (24 in total); including ELB, HANK models, and bounded rationality.

ToTEM Model with ELB constraint

Table 2: Unconditional standard deviations (%), with ELB

Policy Rule	Total CPI inflation	Output gap	First difference of interest rate	Unemployment rate	Real GDP growth (Y/Y)	Real household debt growth
IT	0.67	1.25	0.69	0.89	1.94	5.69
AIT	0.68	1.20	0.71	0.87	1.94	5.69
DM	0.70	1.42	0.57	0.78	2.07	5.68
PLT	0.56	1.56	0.78	0.99	2.19	5.83
NGDP level	0.84	1.58	1.21	0.99	2.01	5.68
NGDP growth	1.18	2.27	1.22	1.34	2.10	5.50

- Except for nominal GDP growth targeting, the implied second moments are pretty similar across frameworks.
- In particular, PLT and nominal GDP targeting do not result in greater stabilization of the output gap or unemployment.

ToTEM Model without ELB constraint

Table 3: Unconditional standard deviations (%), without ELB

Policy Rule	Total CPI inflation	Output gap	First difference of interest rate	Unemployment rate	Real GDP growth (Y/Y)	Real household debt growth
IT	0.68	0.88	0.87	0.78	1.73	5.64
AIT	0.60	0.79	0.79	0.78	1.64	5.55
DM	0.65	1.30	0.63	0.67	2.01	5.66
PLT	0.51	1.51	0.83	0.97	2.10	5.83
NGDP level	0.81	1.55	1.61	0.97	2.01	5.77
NGDP growth	0.75	1.40	2.17	0.91	1.67	5.59

- Absent the ELB constrained, the implied second moments are now pretty similar across all 6 frameworks.
- Again, neither PLT nor nominal GDP targeting do result in greater stabilization of the output gap or unemployment.

HANK Model without ELB constraint

Table 4: Unconditional standard deviations (%) in HANK model

Policy Rule	Inflation	Output gap	First difference of interest rate	Consumption inequality	Welfare Based Loss	Relative Loss
IT	0.57	0.45	1.28	1.09	0.094	1.00
AIT	0.50	0.38	1.33	1.15	0.077	0.82
PLT	0.30	0.68	1.23	2.08	0.052	0.56
NGDP level	0.32	0.60	1.28	1.94	0.051	0.54
NGDP growth	0.36	0.60	1.43	1.92	0.056	0.59

- PLT and nominal GDP targeting lead to relatively greater stabilization of inflation. In absolute terms, however, inflation and output gap volatility is small for all 5 policies.
- Now a welfare gauge to judge policies can be obtained: PLT and NGDP level targeting are closest to optimal policy.

Bounded Rationality without ELB constraint

Table 5: Unconditional standard deviations (%) in Model with Bounded Rationality

Policy Rule	Inflation	Output gap	First difference of interest rate	Welfare Based Loss ¹⁰	Relative Loss
IT	0.45	0.51	0.96	0.013	1.00
AIT	0.46	0.5	1	0.014	1.04
PLT	0.34	0.95	0.87	0.01	0.73
NGDP level	0.39	0.75	1.05	0.011	0.81
NGDP growth	0.37	0.71	1.42	0.01	0.73

- As in HANK, PLT and nominal GDP targeting lead to relatively greater stabilization of inflation. In absolute terms, however, inflation and output gap volatility is small for all policies.
- As in HANK, PLT and NGDP level targeting are closer to optimal policy than IT.

Overall conclusion: Differences across 6 policies rules in 4 state-of-the art models for stabilization of the economy are relatively minor suggesting that a switch to PLT say would neither dramatically increase nor decrease stability of the Canadian economy.

Comment 1: Is it really a ‘horse race of alternatives to the 2 percent inflation target’?

- For all policy frameworks (IT, AIT, PLT, NGDP Level, NGDP Growth, and Dual Mandate) long-run expected inflation is by construction 2 percent.
- The solution to most models uses a log-linear approximation so that the population mean of inflation cannot be anything else but the 2 percent inflation target that is hard wired into the model.
- Therefore it is natural to focus the horse race on second moments because first moments of all variables the model makes predictions about will by construction be identical under all the monetary policy frameworks considered.

Comment 2: Can Monetary Stabilization Policy Change the Mean of Variables?

My impression is that the horse race is run using linearized models so that means of variables are the same as deterministic steady state values and that those are identical under all 6 frameworks considered. Is that correct? In ToTEM with ELB, do the 6 frameworks affect means? If so, it would be good to report this.

More generally, given the sophistication of the modeling approach and solution methods displayed in the analysis, would it be feasible to run a horse race in models in which stabilization policy does affect levels of variables and thus has first-order welfare effects (e.g., models with the ELB or models with DNWR as in Schmitt-Grohe and Uribe, JPE 2016; or models with pecuniary externalities due to borrowing constraints).

One line of argument for raising the inflation target is precisely about being able increase mean output and lower mean unemployment.

Comment 3: Comparing the alternative policy frameworks

- A Suggestion: In addition to reporting standard deviations, why not use the model, say ToTEM, to extract the shocks that hit the Canadian economy between 1995 and now, under an IT rule (actual policy). Plot inflation, output, and the policy rate over time as observed and as implied under the alternative (counterfactual) monetary policy frameworks (AIT, PLT, NGDP Level, NGDP Growth, and Dual Mandate).

This would allow one to see whether different frameworks would have made an economically important difference for the historic path of key macro aggregates and the policy rate itself.

Comment 4: PLT and NGDP dominate in HANK— robustness?

For the HANK model, Table 4 shows that PLT and NGDP targeting have a lower welfare loss than IT. It seems that those welfare calculations depend on the underlying assumptions about fiscal policy. The added distortions of the HANK model, namely, idiosyncratic income risk that is uninsurable, is sensitive to the specification of fiscal policies such as unemployment insurance, disability insurance, and retraining of displaced workers. And the stance of fiscal policy then changes effects of monetary policy. It might be worthwhile to explore more how robust the result that PLT and NGDP welfare dominate IT is to changes in assumptions about fiscal policy.

Comment 5: The promise and potential perils of more forward guidance

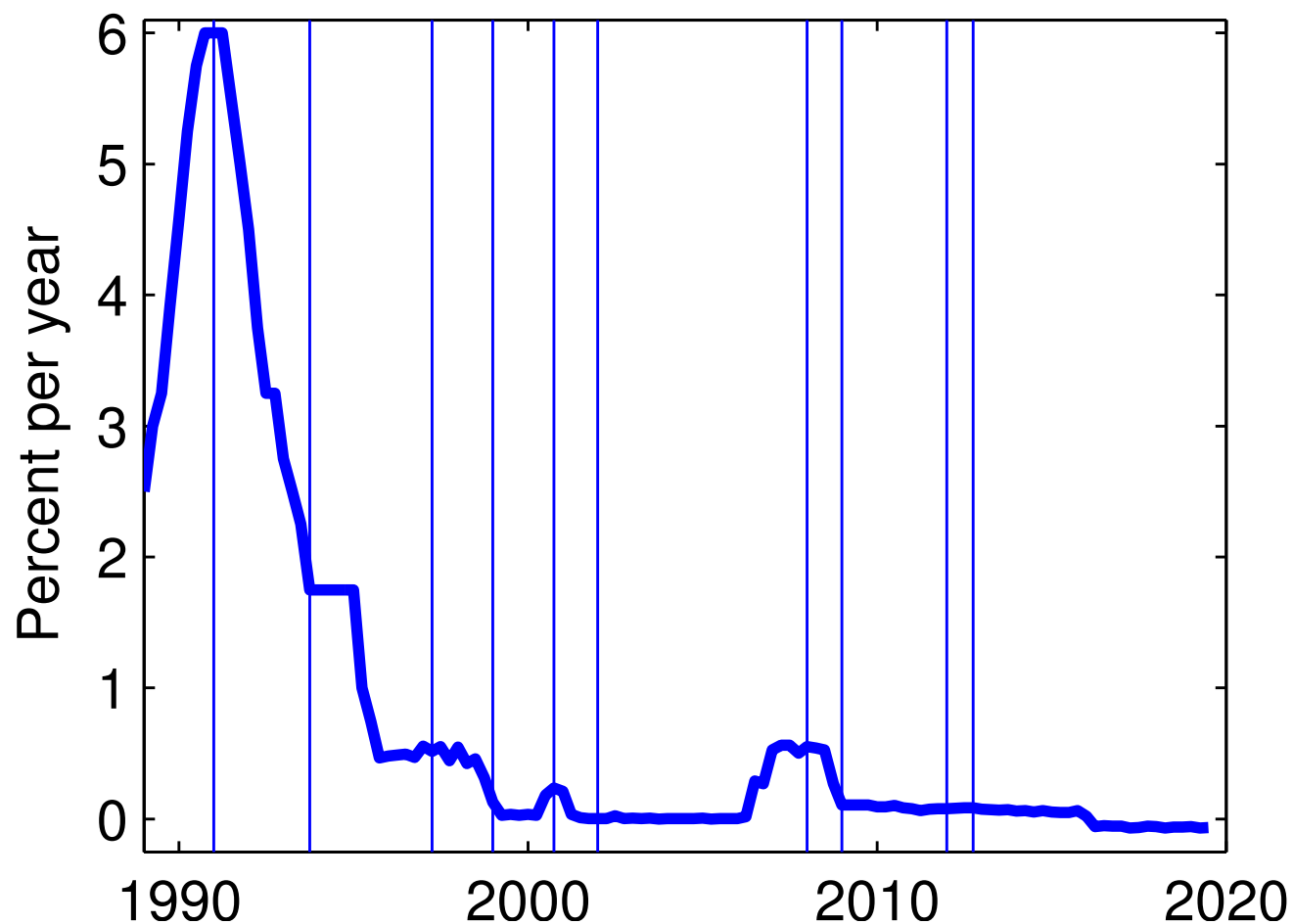
The interest in AIT, PLT, and NGDP level, is, I assume, related to the fact that other central banks are discussing potential changes to their frameworks in the direction of more forward guidance via price level or nominal GDP targeting.

The academic literature on optimal monetary policy suggests that these frameworks may have advantages over straight IT. For example, they require higher inflation in the future after an episode of inflation below target. This raises expected inflation above target and in this way lowers real rates, which in turn stimulate demand (in the spirit of forward guidance).

Implementation of PLT or NGDP takes the form of lower rates for longer in response to shocks that drive inflation below target. This raises the question: Does setting nominal rates at zero for an extended period of time raise inflation? Or could it have the unintended consequence of unanchoring inflationary expectations?

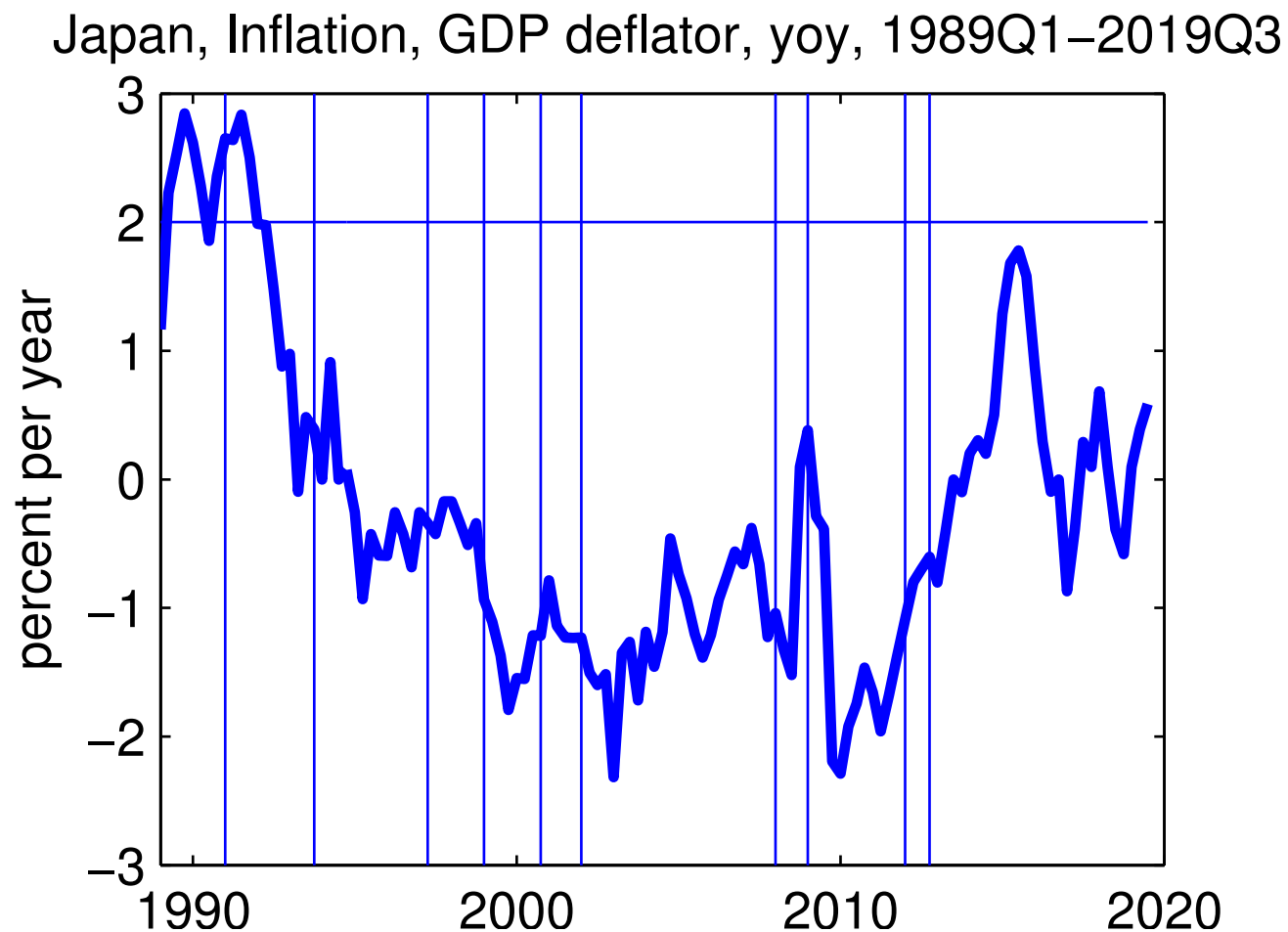
Japan has had near zero rates ever since 1995

Japan, Call rate, 1989Q1–2019Q3



Vertical lines: Cabinet office recession dates, 1991Q1, 1993Q4, 1997Q2, 1999Q1, 2000Q4, 2002Q1, 2008Q1, 2009Q1, 2012Q2, and 2012Q4.

... yet inflation has been below target throughout.

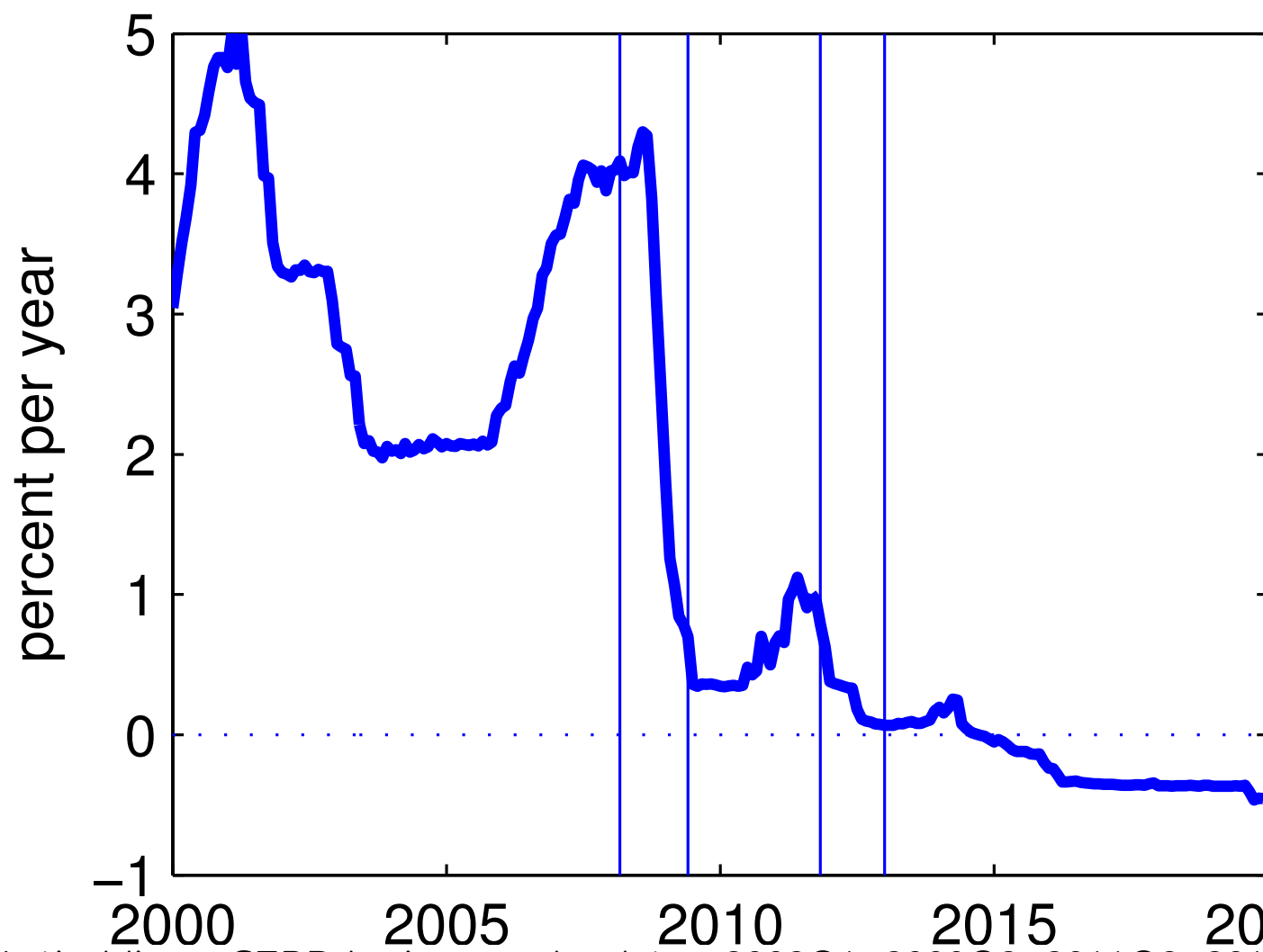


Vertical lines: Cabinet office recession dates, 1991Q1, 1993Q4, 1997Q2, 1999Q1, 2000Q4, 2002Q1, 2008Q1, 2009Q1, 2012Q2, and 2012Q4.

Horizontal line: 2% inflation target.

Since 2009 near zero rates in the Euro area ...

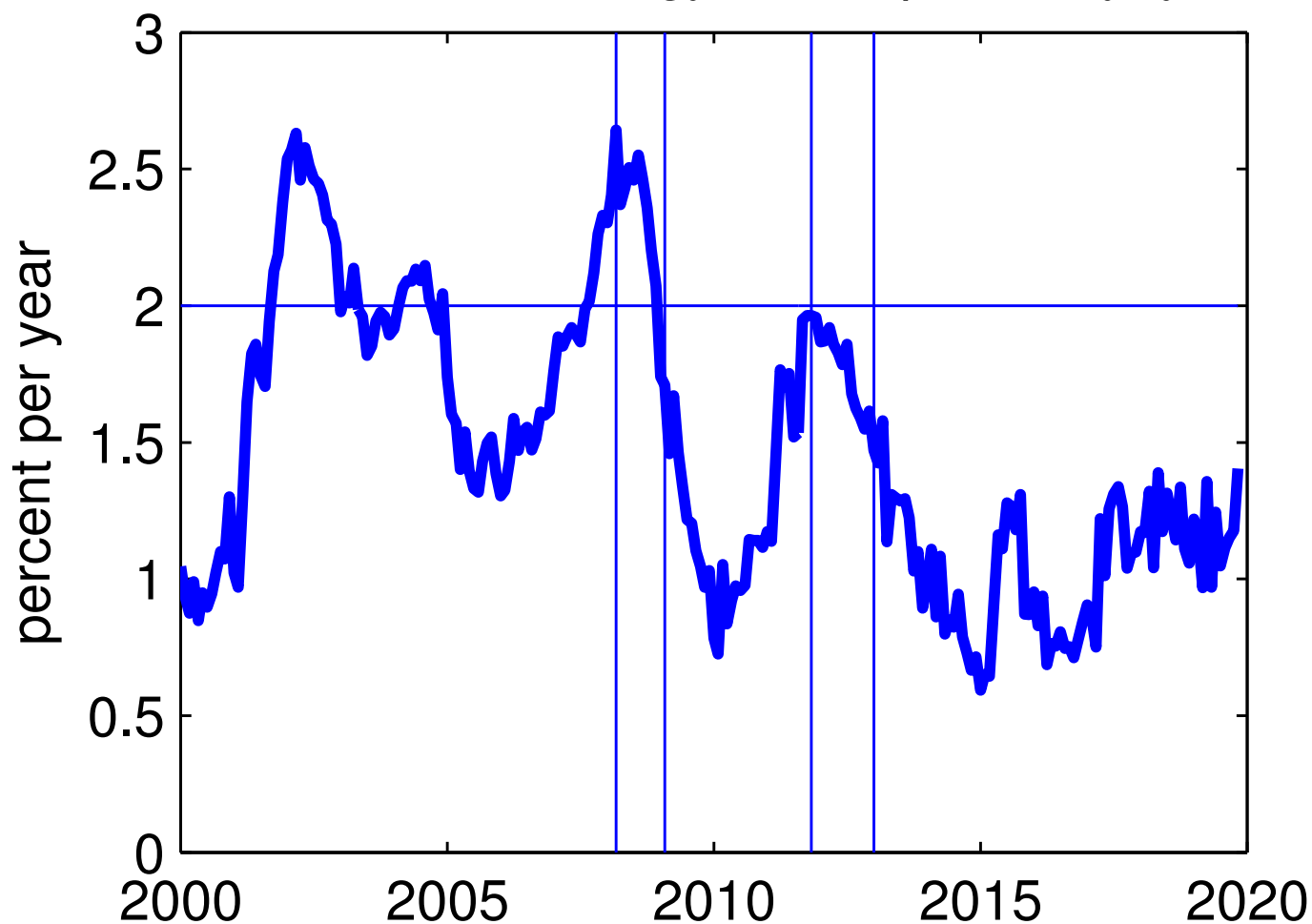
Euro area, Interest Rate, Eonia, 2000:1–2019:12



Vertical lines: CEPR business cycles dates, 2008Q1, 2009Q2, 2011Q3, 2013Q1.

... yet, inflation remains below 2% target...

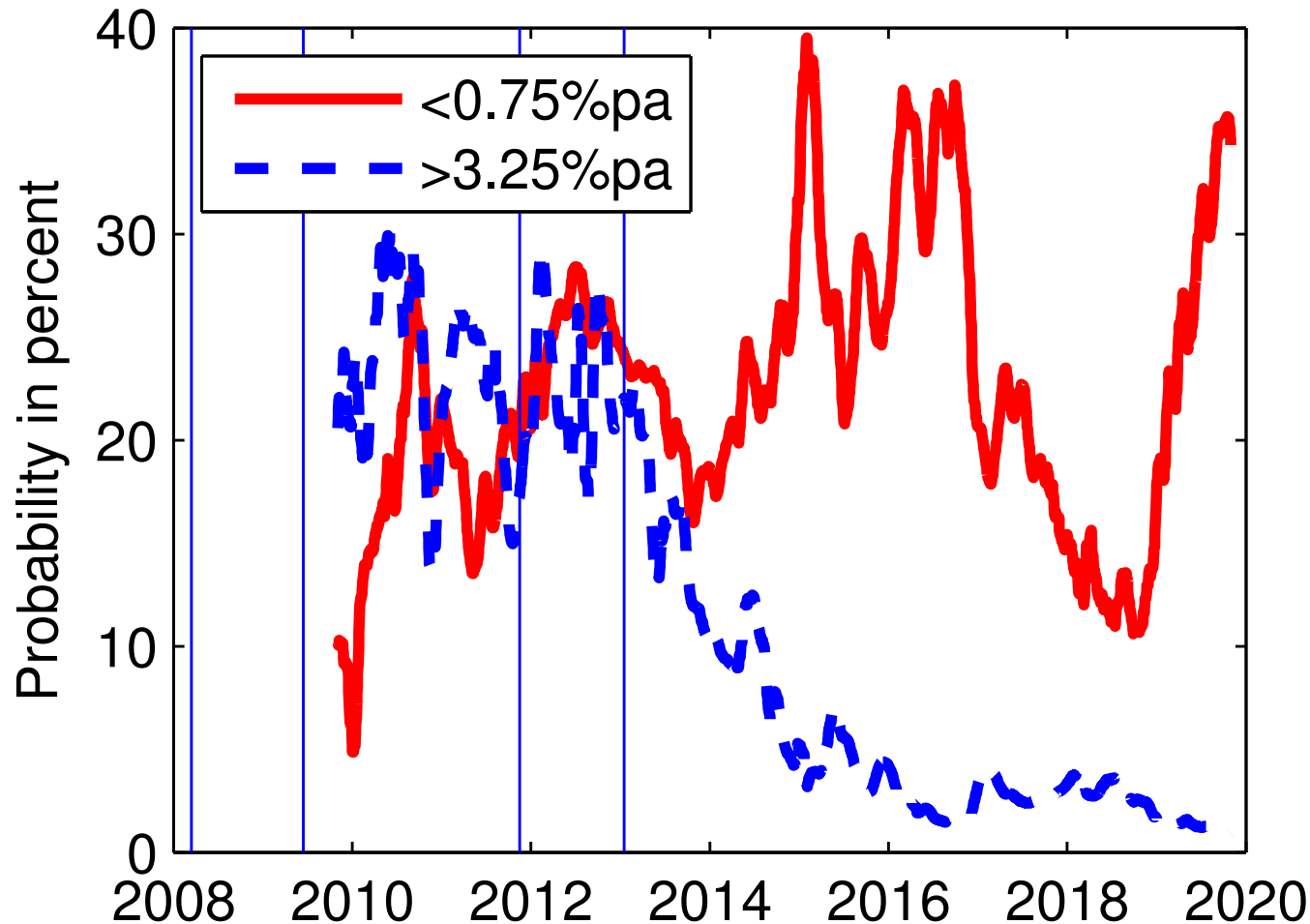
Euro area, Inflation, HICP ex energy and unp. food, yoy, 2000:1–2019:11



Vertical lines: CEPR business cycles dates, 2008Q1, 2009Q2, 2011Q3, 2013Q1.

... and chances of long-run inflation below 0.75% are high.

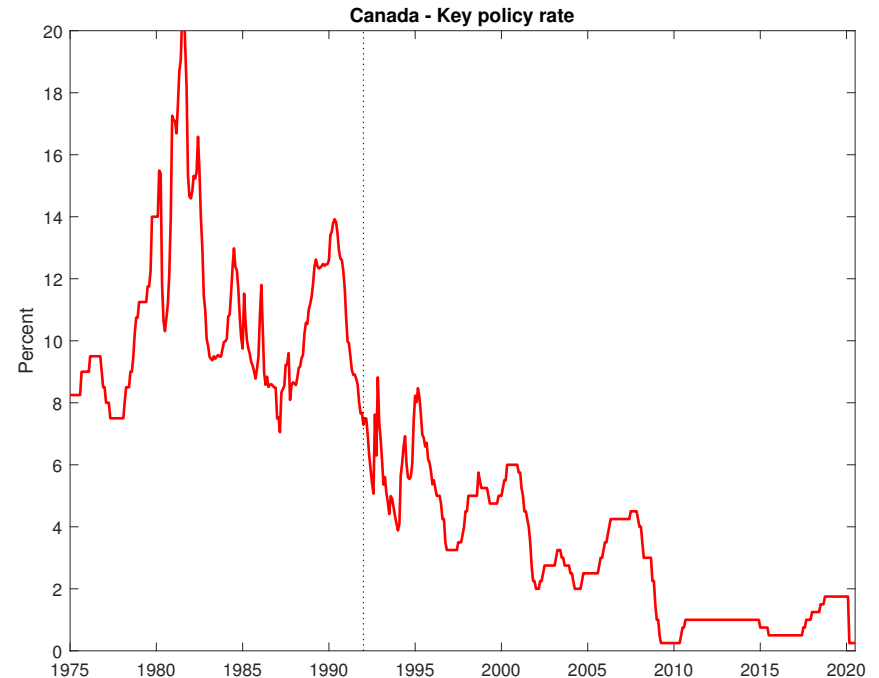
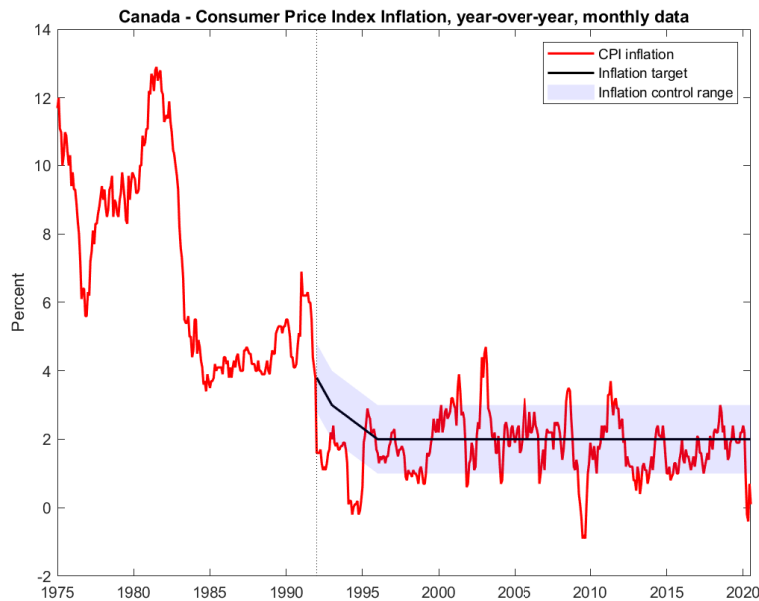
HICP over next 10 years: Large increase and large decrease probabilities



Data source, Vogt, 2020. Twenty-day moving averages of daily options-implied inflation probabilities, Oct 6, 2009 to Nov 1, 2019. Vertical lines: CEPR business cycle dates, 2008Q1, 2009Q2, 2011Q3, 2013Q1.

Conclusion

- Inflation targeting with a 2 percent target has been extremely successful in Canada;



- Secular decline in neutral rate does not appear to have kept Canada from hitting its inflation target;
- Horse race results similarly suggest gains and losses from switching to price level or nominal GDP targeting are minor.