Raising an Inflation Target: the Japanese Experience with Abenomics

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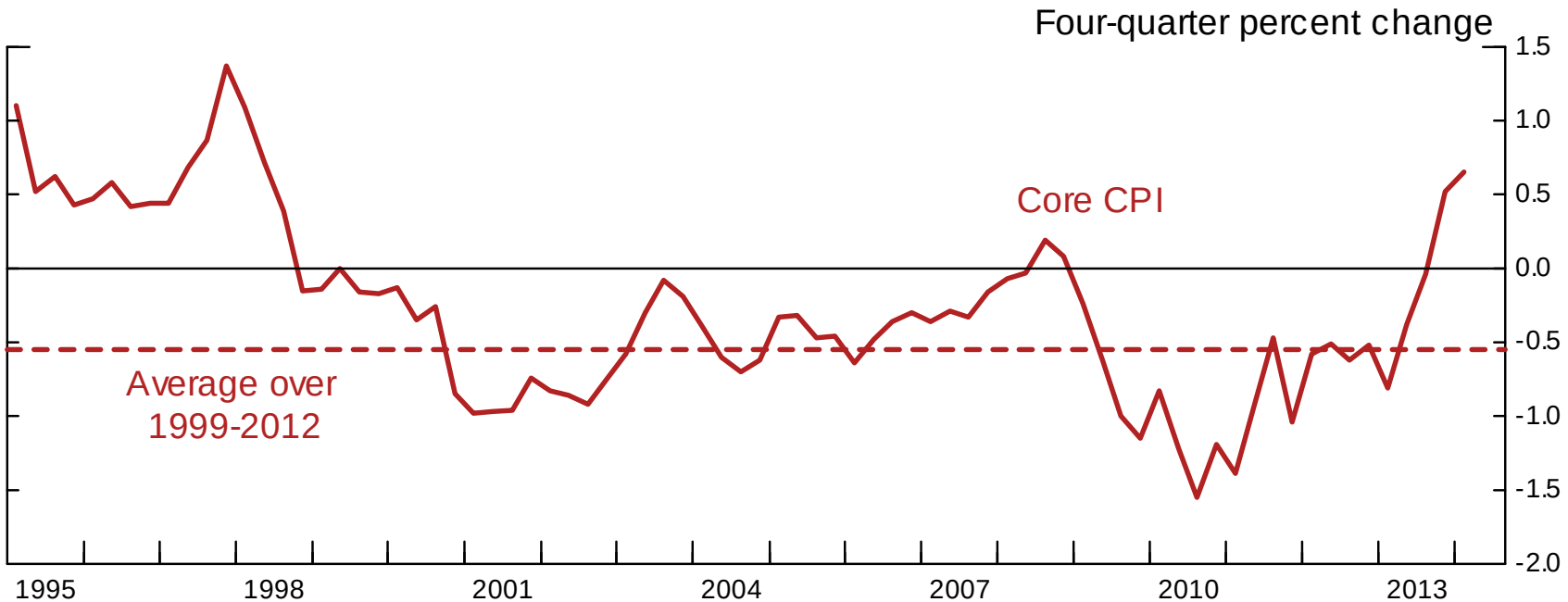

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  - **April 2013**: BOJ unveils "Quantitative and Qualitative Monetary Easing" (QQE).

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- However, such policy might have more limited effects, if it is not fully credible.
- Japan's recent experience raises this concern as inflation expectations have risen only partially.

Outline

- Data with limited theory: The effects of inflation target shocks using a VAR model
- Theory with limited data: Inflation target shocks in two DSGE models

Quantifying Changes in the Inflation Target: A VAR

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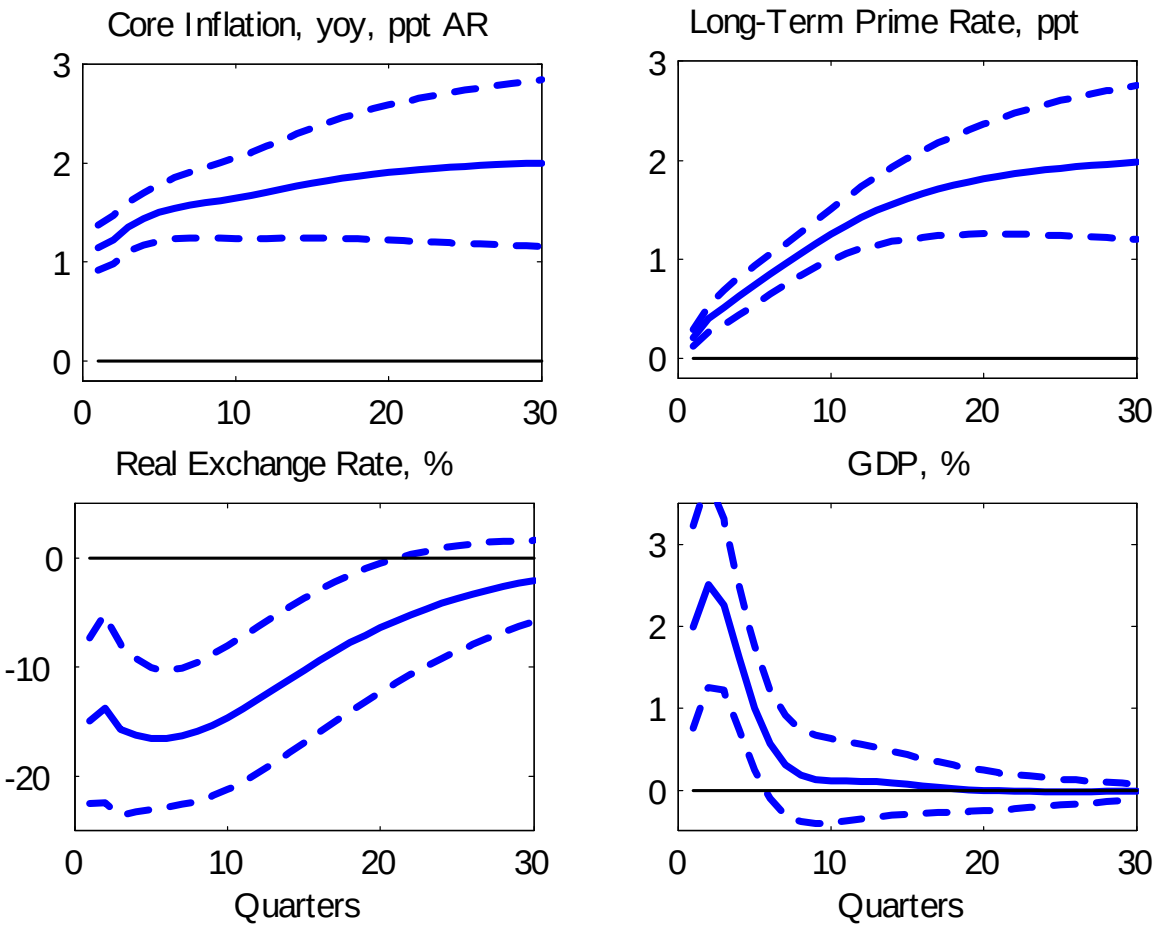
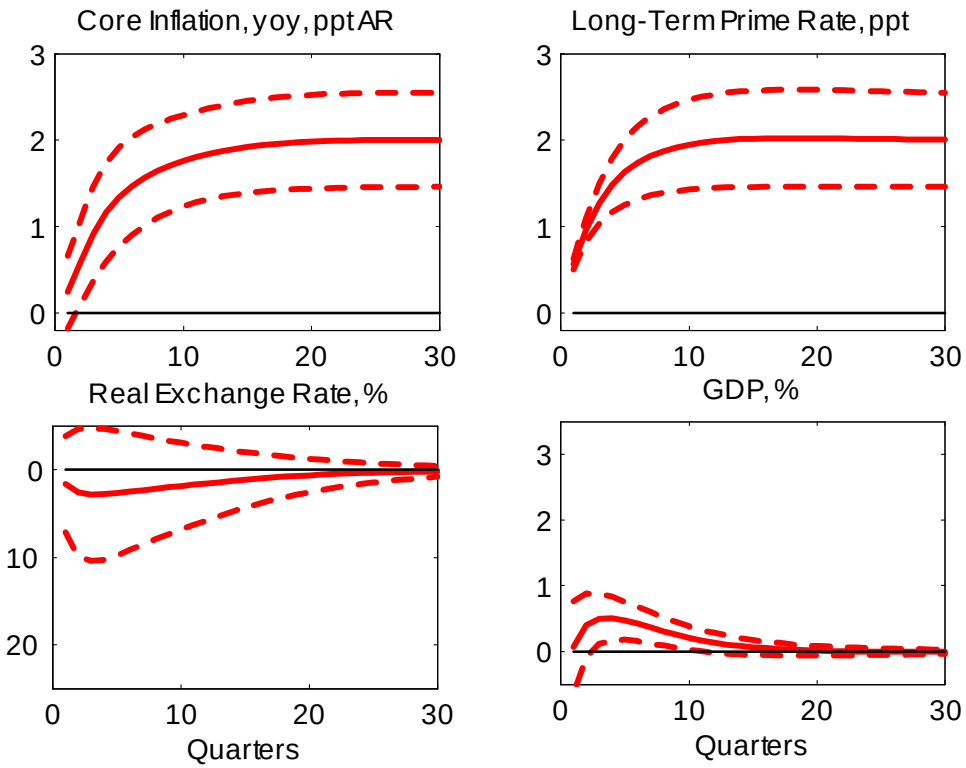
- No restriction on short-run effects.

VAR: Responses to a 2% Inflation Target Shock



1992Q1-2012Q4

VAR Impulse Responses: no ZLB vs. ZLB



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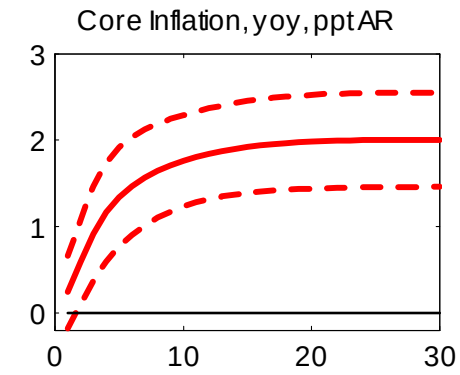

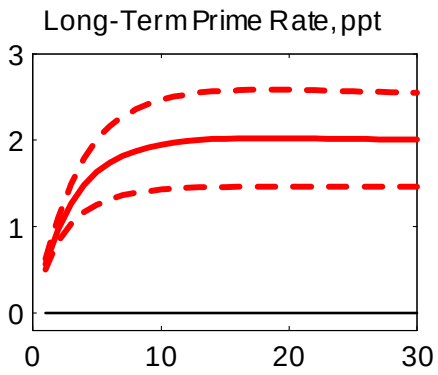

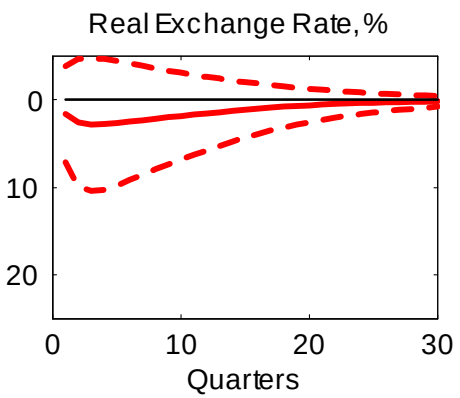

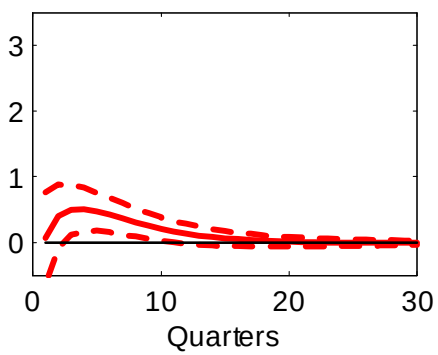

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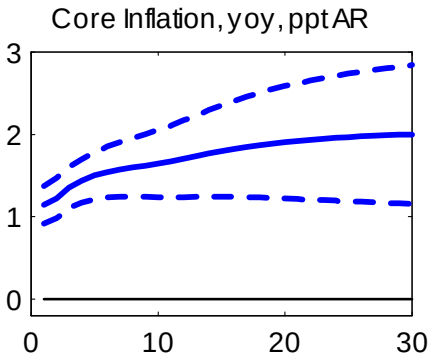

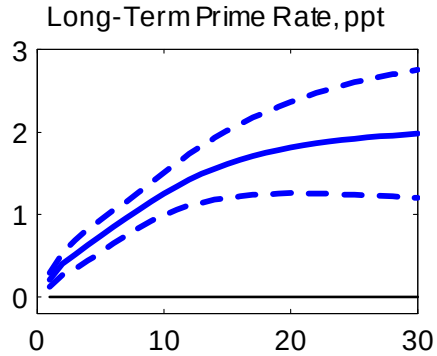

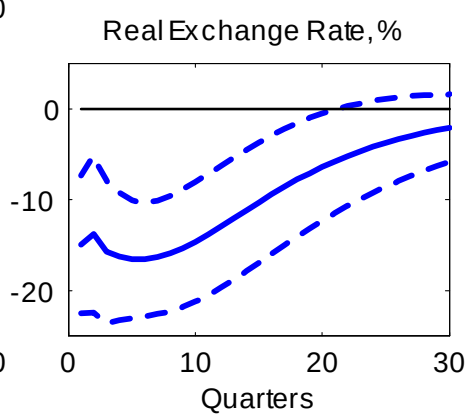

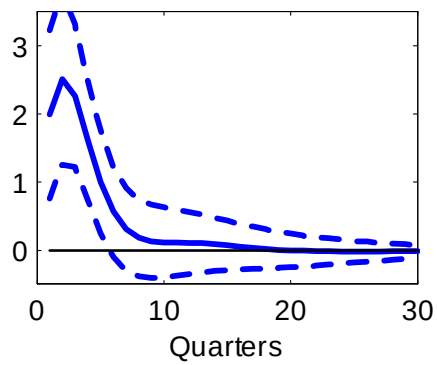

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Summary of VAR Results

- Reflating the economy leads to (1) a persistent depreciation; (2) a short-run output boost.
- The muted response of interest rates boosts output more for given increase in inflation.
- Responses at the ZLB are much larger.
- Are these shocks plausible/frequent?
  No.
  An inflation target shock of 2 percentage points is a 6 standard deviation shock in our sample.

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- Taylor rule

$$r_t = \max\left(0, \phi_r r_{t-1} + (1-\phi_r)\left(1\% + \pi_t + \phi_\pi\left(\pi_t - \pi_t^*\right) + \frac{\phi_y}{4}\widetilde{y}_t\right)\right)$$

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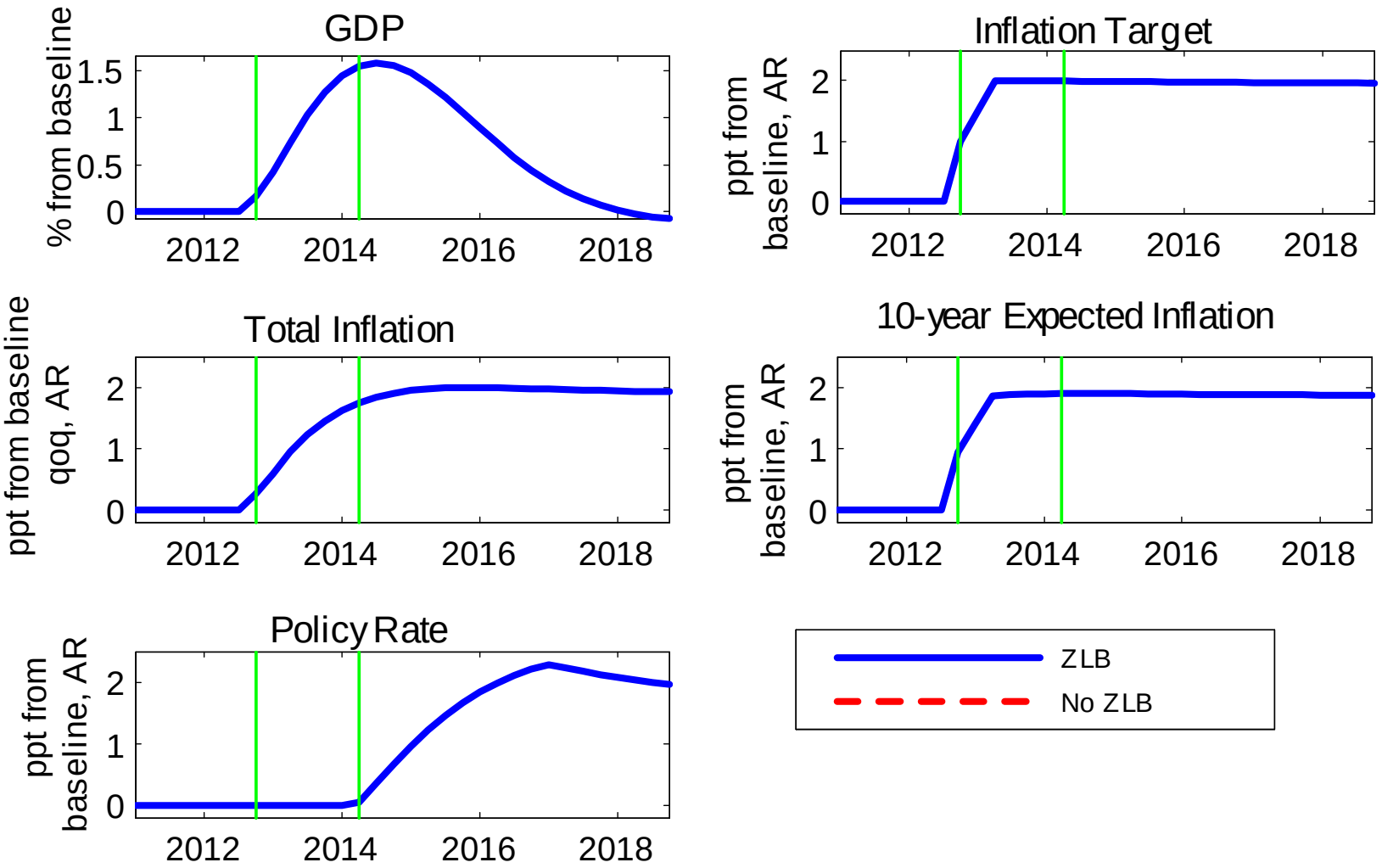
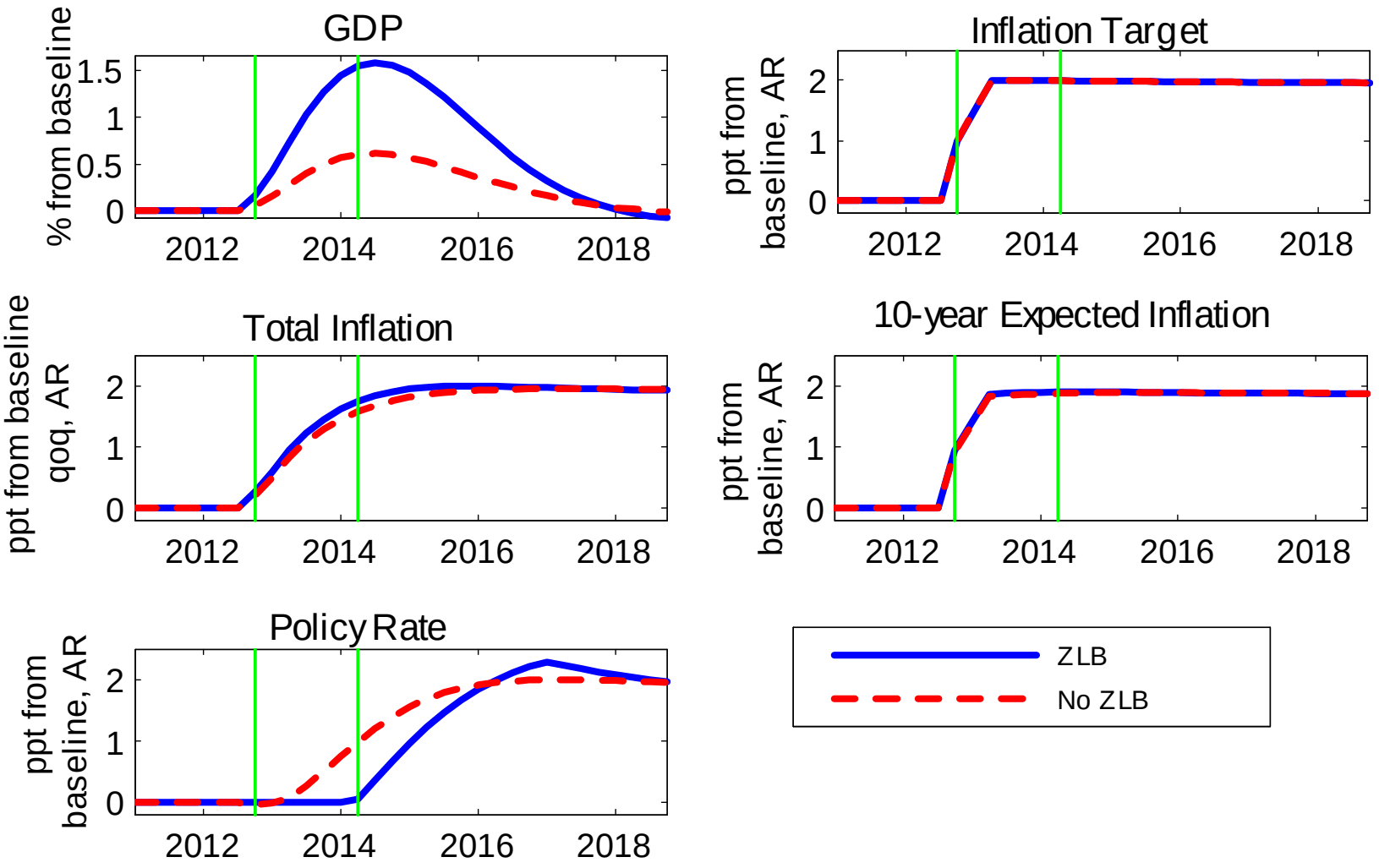
- What happens when a new $\pi_t^* = 2\%$ target is announced (starting from 0%)?

Inflation Target Shock in a NK Model



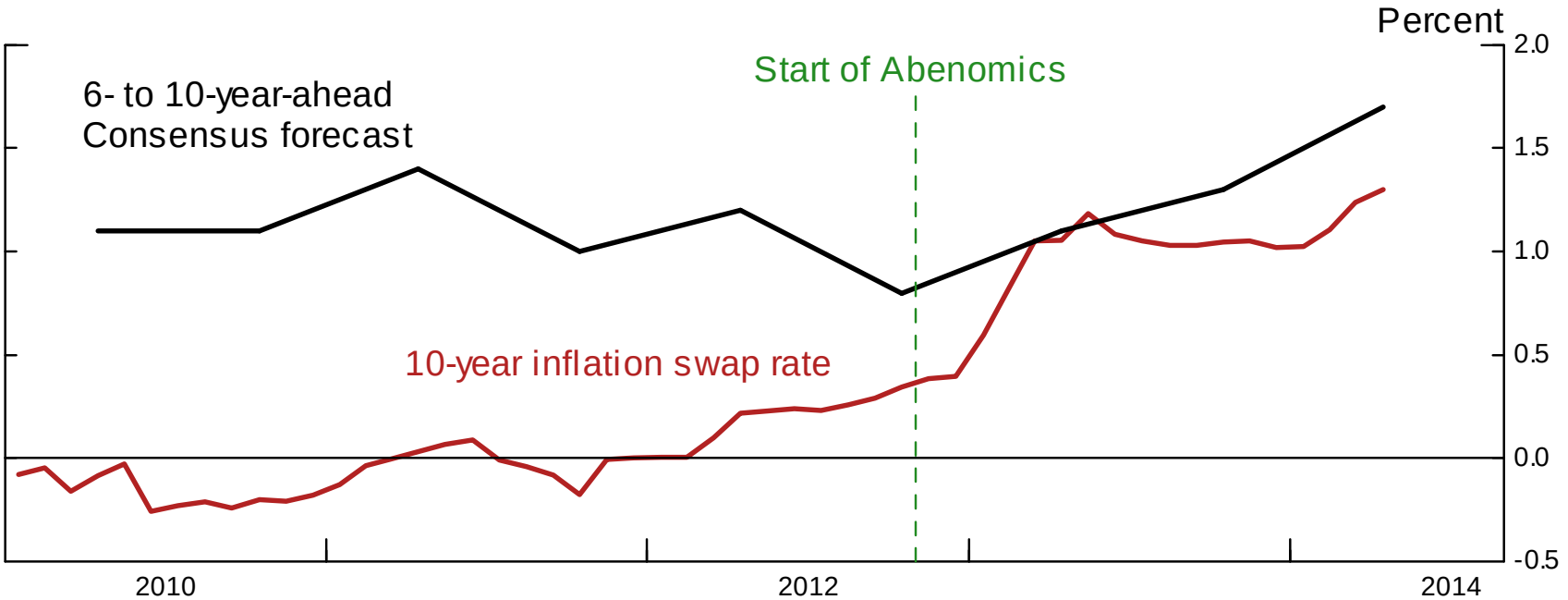
Inflation Target Shock: ZLB (our benchmark) vs no ZLB



Summary of Baseline NK Model

- Inflation target shock moves inflation and inflation expectations close to target by early 2014 (despite large price rigidity.)
- Inflation target shock has powerful effects on GDP (especially in liquidity trap.)
- However, neither inflation nor inflation expectations are at 2 percent today.

Inflation expectations since the start of Abenomics



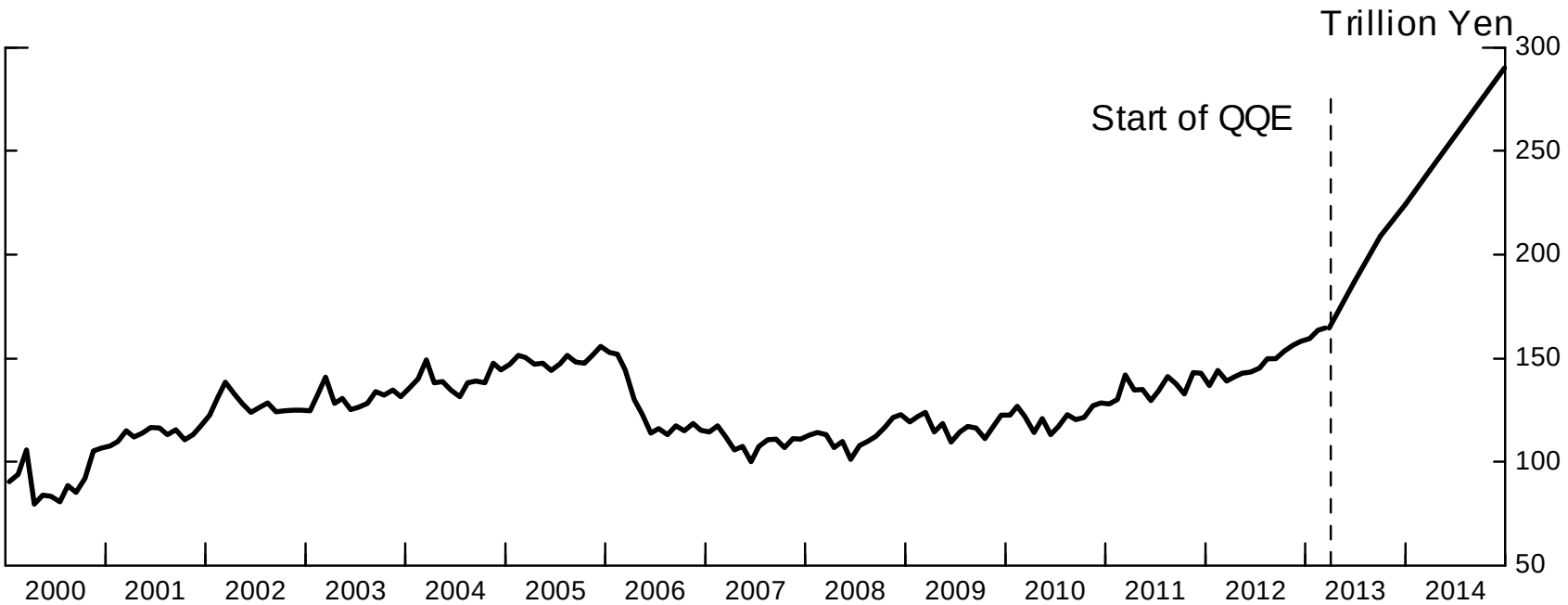
Long-Term Inflation Expectations

Imperfect Observability

- No realistic amount of price rigidity can explain why long-run inflation expectations are not at 2 percent yet.
- We thus modify the model to allow for imperfect credibility about the inflation target.
- Want to capture two ideas:
  - agents are unsure about the BOJ's degree of commitment
  - agents are unsure as to what the BOJ will do in the future.

Abenomics: the BOJ's QQE

QQE calls for a rapid and **open-ended** expansion of the BOJ balance sheet until the 2 percent target is reached.



Imperfect Credibility

The central bank follows a Taylor rule subject to the ZLB:

$$r_t = \max\left(0, \phi_r r_{t-1} + (1-\phi_r)\left(rr + \pi_t + \phi_\pi(\pi_t - \pi_t^*) + \frac{\phi_y}{4}\widetilde{y}_t\right) + e_t\right)$$

π_t^* : persistent monetary policy shock

e_t : transitory monetary policy shock

Formally:

$$\begin{bmatrix} \pi_t^* \\ e_t \end{bmatrix} = \begin{bmatrix} 0.999 & 0 \\ 0 & 0.001 \end{bmatrix} \begin{bmatrix} \pi_{t-1}^* \\ e_{t-1} \end{bmatrix} + \begin{bmatrix} \varepsilon_{pt} \\ \varepsilon_{qt} \end{bmatrix}$$

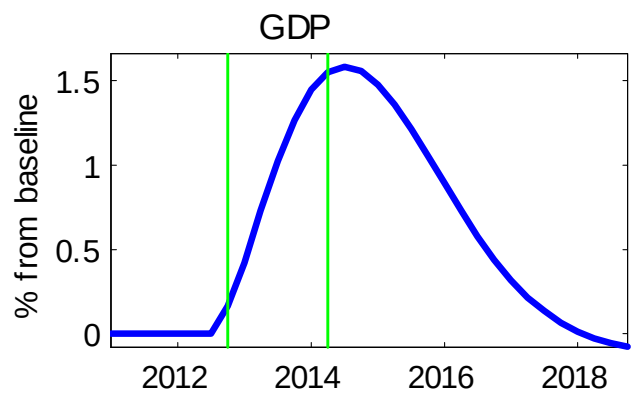
$$\varepsilon_{pt} \sim N\left(0, \sigma_p^2\right), \ \varepsilon_{qt} \sim N\left(0, \sigma_q^2\right)$$

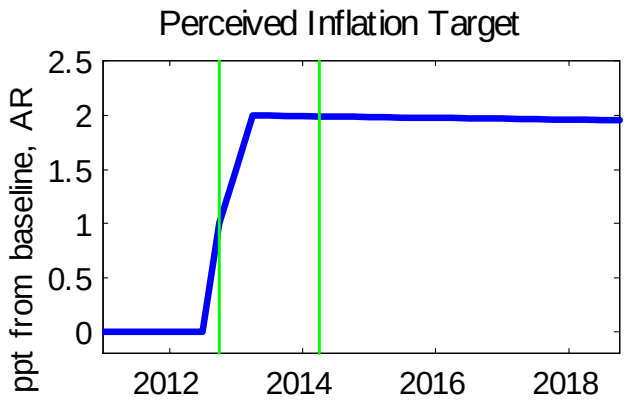
$$\underset{\text{inflation target}}{Z_t} = \underset{\text{persistent component}}{\pi_t^*} \underbrace{- (1-\phi_r)^{-1}\phi_\pi^{-1} e_t}_{\text{transitory component}}$$

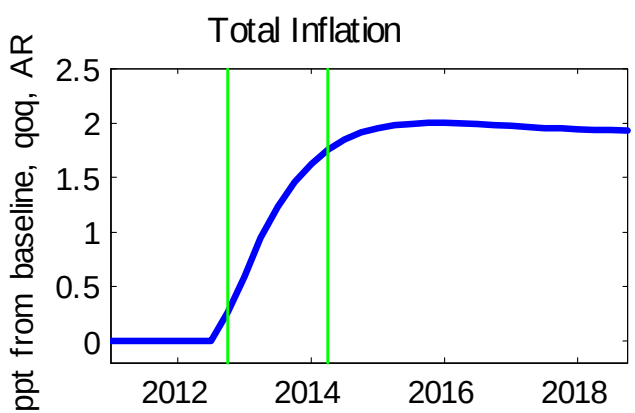
Imperfect Credibility: Some Intuition

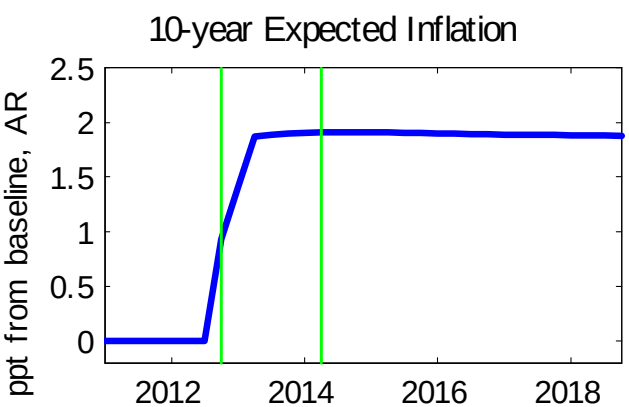
- The BOJ challenge: it would like to change long-run inflation ($E_t \pi_{t+\infty}$) and r_t in a "stable manner", affecting $\left[\pi_t^*, E_t \pi_{t+1}^*, E_t \pi_{t+2}^*, ...\right]$ ....
- ....but agents might not be able to tell whether the target and the long-run interest rate are changing on a permanent or transitory basis.
- In other words, agents cannot tell whether the current deviations from the historical policy rule are going to last "forever" (π_t^*) or not (e_t).
- We calibrate the imperfect credibility by the signal-to-noise ratio, σ_p^2/σ_q^2 :
  - σ_p^2/σ_q^2 high: inflation target shock fully credible (as before)
  - σ_p^2/σ_q^2 low: inflation target shock less than fully credible.

Impulse Responses: Perfect vs Imperfect Credibility









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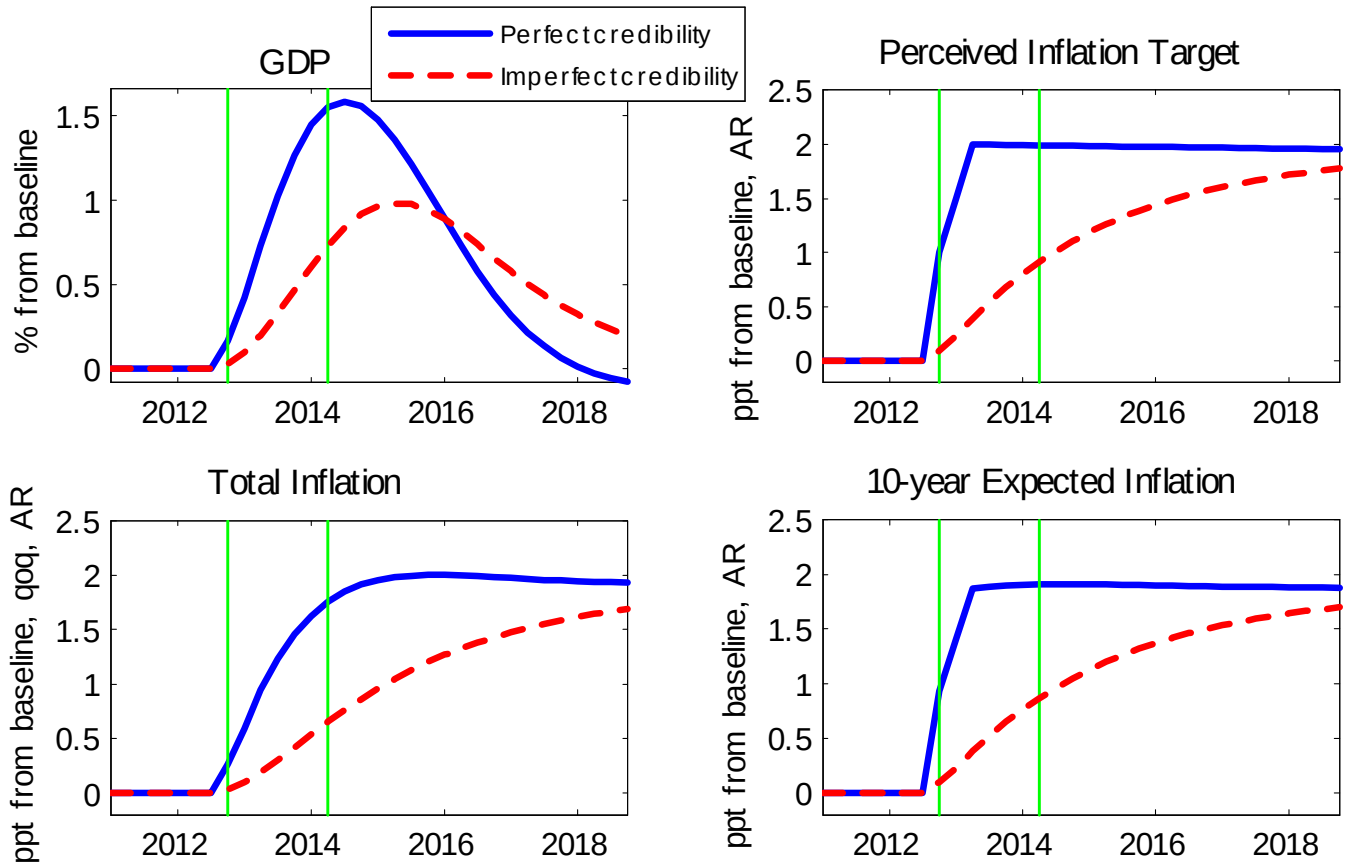

Calibrate signal-to-noise to get rise in expected inflation as in data: effect on GDP is now smaller

Model Results so Far

1. Inflation target shocks can be powerful at the ZLB.
2. Inflation target shocks are more powerful the more agents expect them to be permanent (the larger the signal-to-noise ratio σ_p^2/σ_q^2.)

Quantifying the Effect of Abenomics

- How much progress has Japan made so far?
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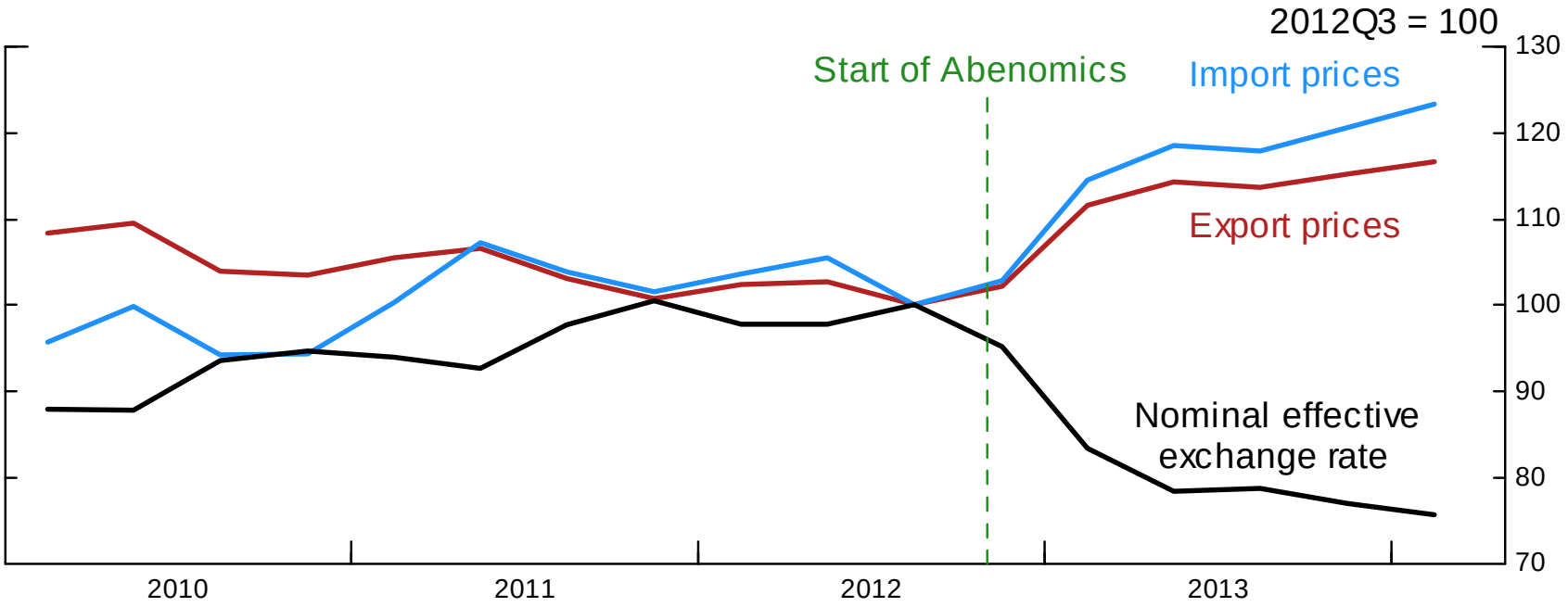
- However, international variables may suggest otherwise.
  Exchange rate and trade price movements have been large since Abenomics.
  Want to understand their role.

External prices since the start of Abenomics



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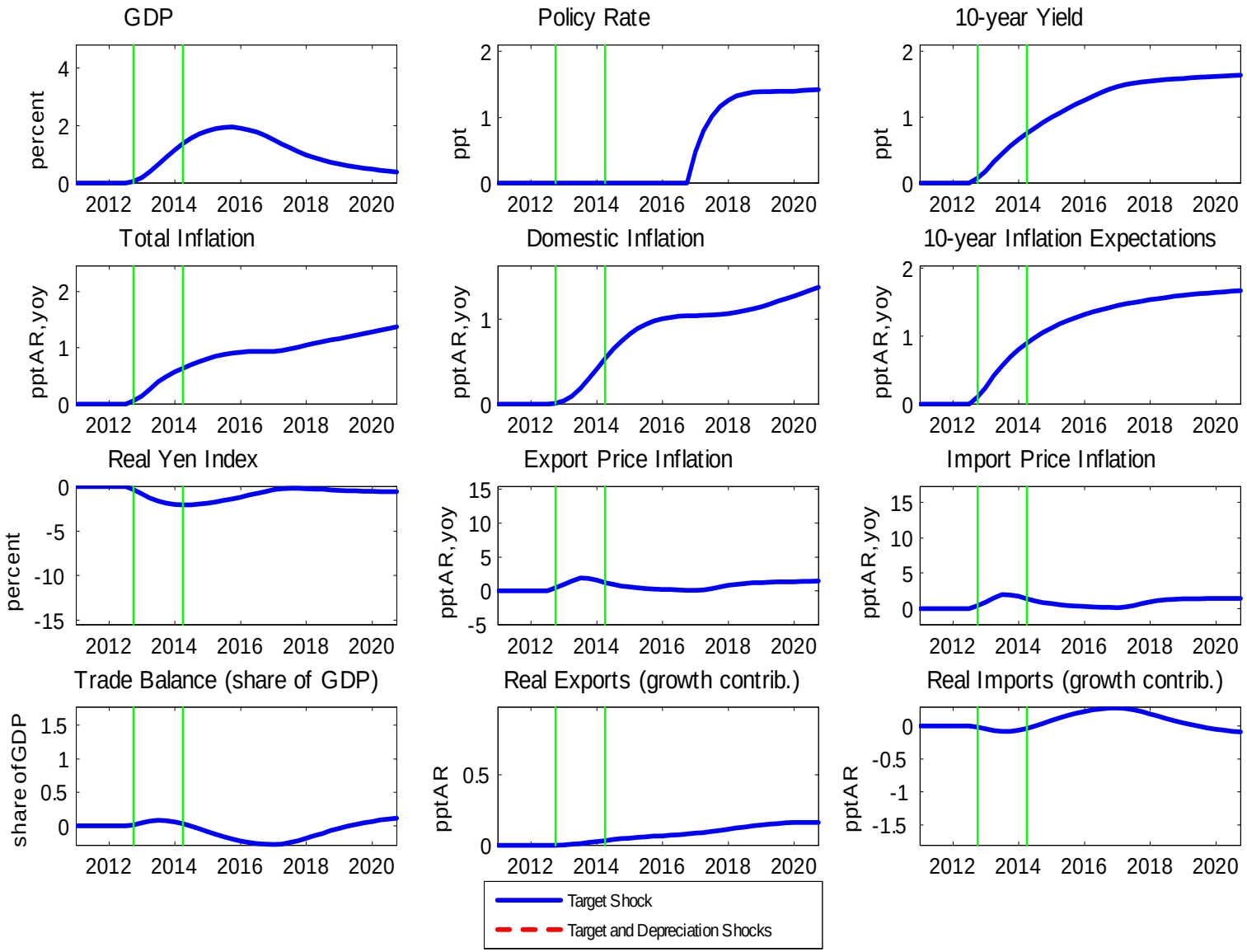
- Model features LCP. We assume that:
  1. Japanese exporters change their prices (in dollars) very infrequently –> Exports respond little to exchange rate.
  2. U.S. and ROW exporters adjust their prices (in yen) more frequently –> Imports respond strongly to exchange rate.

Inflation Target Shock in SIGMA



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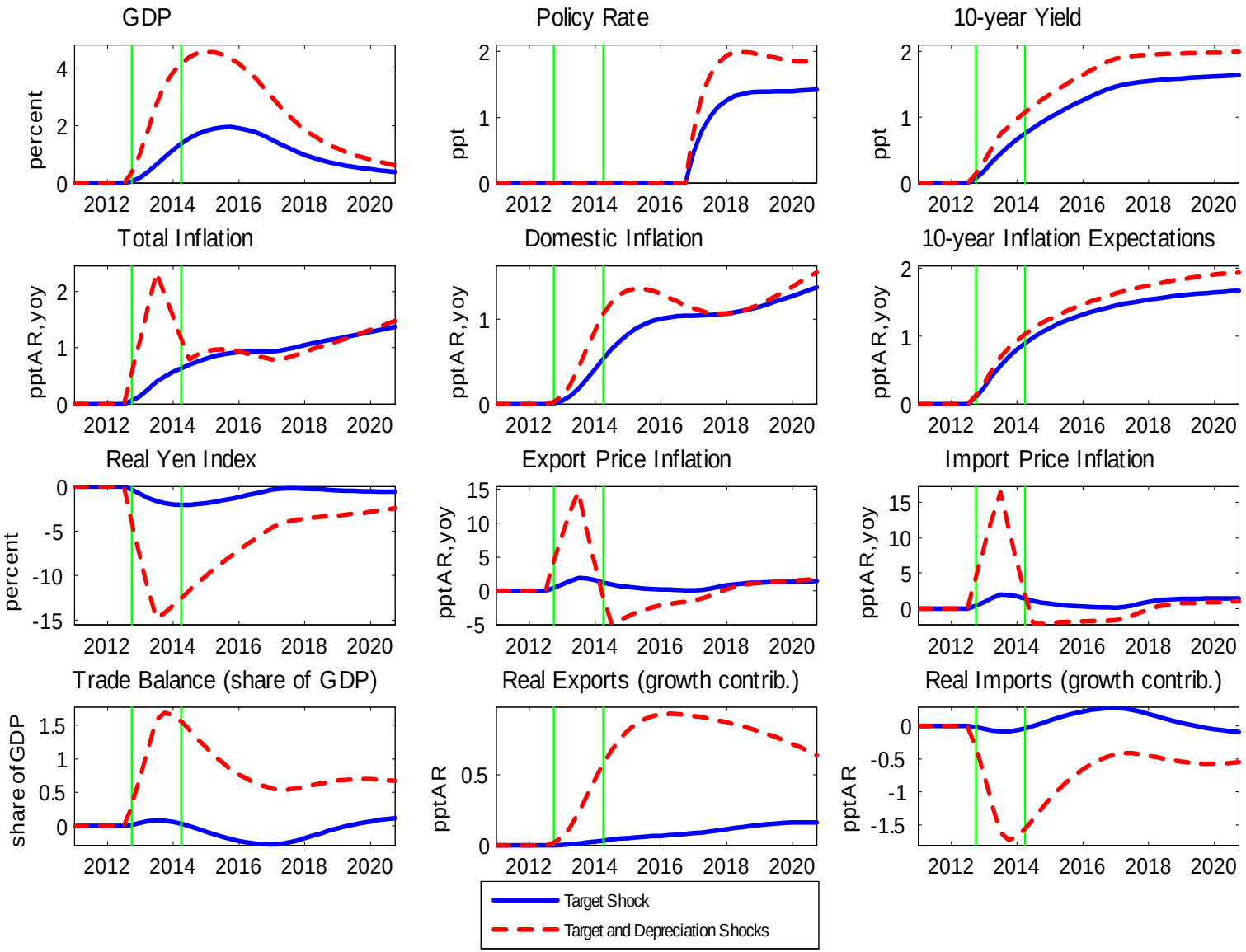
- Imperfect credibility mitigates response of inflation and inflation expectations.
- The depreciation which gives small but transient boost to GDP. The shock mostly affects GDP through a domestic demand channel.
- Inflation rises towards its target very slowly.
- However, model unable to capture large yen depreciation seen in the data and through the VAR.
  Layer depreciation shock on top of inflation target shock.

Inflation Target and Depreciation Shocks in SIGMA



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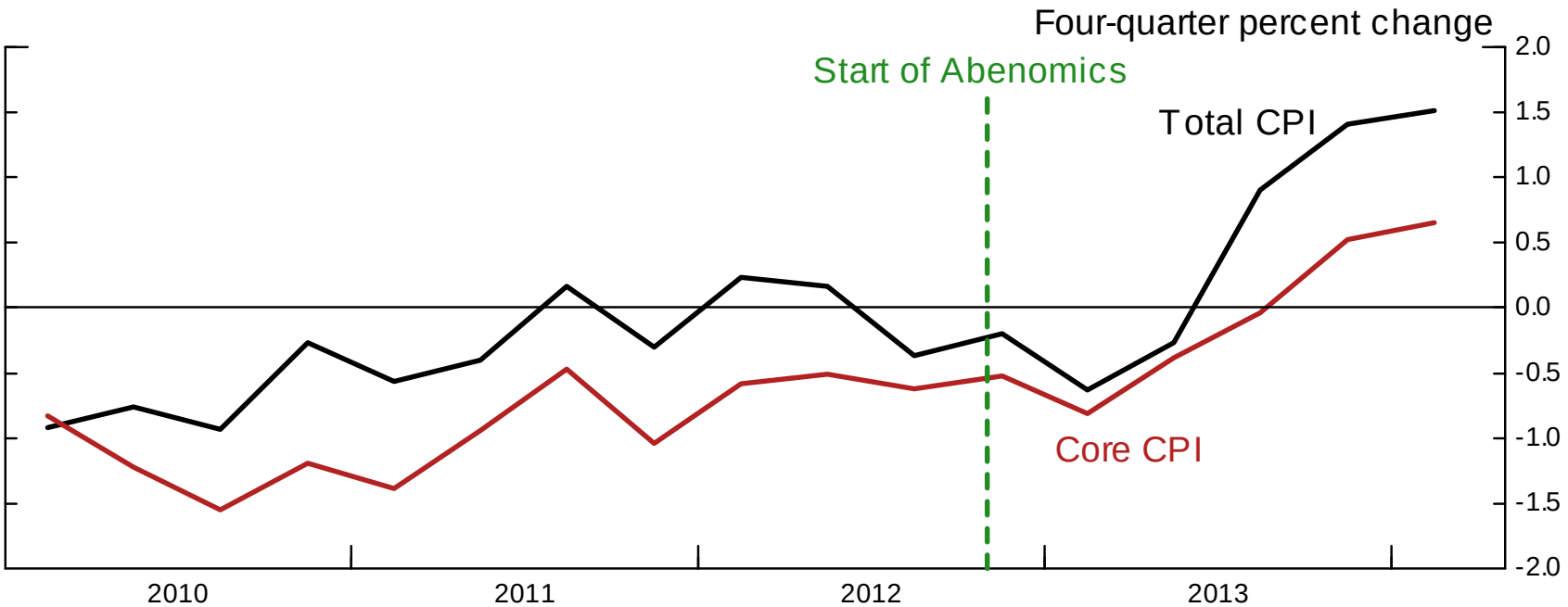
- The surge in total inflation is reversed quickly as the inflationary impulse of depreciation dies out.
- Inflation eventually rises towards its target very slowly.

Total and Core Inflation since Abenomics



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  2. jointly study the effects of structural reforms and changes in the inflation target.

Imperfect Observability – Background Calculations

When the ZLB does not bind we can rewrite the Taylor rules as:

$$
\begin{aligned}
r_t &= \phi_r r_{t-1} + (1-\phi_r)\left(rr + \pi_t + \phi_\pi(\pi_t - \pi_t^*) + \frac{\phi_y}{4}\widetilde{y}_t\right) + e_t \\
&= \phi_r r_{t-1} + (1-\phi_r)\left(rr + \pi_t + \phi_\pi \pi_t - \phi_\pi \pi_t^* + \frac{\phi_y}{4}\widetilde{y}_t + \frac{e_t}{1-\phi_r}\right) \\
&= \phi_r r_{t-1} + (1-\phi_r)\left(rr + \pi_t + \phi_\pi \pi_t - \phi_\pi \pi_t^* - \frac{-\phi_\pi e_t}{(1-\phi_r)\phi_\pi} + \frac{\phi_y}{4}\widetilde{y}_t\right) \\
&= 0, \phi_r r_{t-1} + (1-\phi_r)\left(rr + \pi_t + \phi_\pi \pi_t - \phi_\pi\left(\pi_t^* - \frac{e_t}{(1-\phi_r)\phi_\pi}\right) + \frac{\phi_y}{4}\widetilde{y}_t\right) \\
&= \phi_r r_{t-1} + (1-\phi_r)\left(rr + \pi_t + \phi_\pi \pi_t - \phi_\pi(Z_t) + \frac{\phi_y}{4}\widetilde{y}_t\right) \\
&= \phi_r r_{t-1} + (1-\phi_r)\left(rr + \pi_t + \phi_\pi(\pi_t - Z_t) + \frac{\phi_y}{4}\widetilde{y}_t\right)
\end{aligned}
$$