The Impact of Unconventional Monetary Policy: DSGE Model with Zero Lower Bound on Interest Rates.

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Zero Lower Bound

- Interest rates near or at zero
- Central bankers unable to moderate economy
- Japan in 1990s, USA since 2009, ECB + CNB since 2012Q4

Exchange rate intervention

- November 2013 - exchange rate as an additional instrument of monetary expansion
- Asymmetric exchange rate commitment – the minimal value of FX rate set on 27 CZK/EUR
- End of exchange rate intervention – “the koruna exchange rate to be used as a monetary policy instrument until the end of 2016”

Discussion of impact

- Criticism
  – Higher price of imports $\Rightarrow$ higher price of imported inputs
  – Lower real wages $\Rightarrow$ low demand
- CNB denies negative influence on real wages
- The amount of employed workers increases + the amount of available jobs rises
- Contribution of intervention vs. positive foreign demand
- Low inflation rate persist – deflation in 2015

Method

- Based on – Malovaná (2014) – The Effectiveness of Unconventional Monetary Policy Tools at the Zero Lower Bound: A DSGE Approach
- Model – Justiniano, Preston
- Intervention – Montoro, Ortiz (2012) – Foreign exchange intervention and monetary policy design: A market microstructure analysis.
- ZLB – Holden, Paetz (2012) – Efficient Simulation of DSGE models with inequality constraints.
- Matlab R2014a, toolbox Dynare 4.4.3

Intervention

- Continuum of exchange dealers who are risk averse
- Each dealer receives w_t^d and $w_t^{d,CB}$ of bonds in domestic currency from households and CB and w_t^{d*} and $w_t^{d*,CB}$ in foreign currency from foreign investors and central bank
- Each one sets his portfolio to maximize utility function $-E_t^d \exp -\gamma \Omega_{t+1}^d$, where Ω_{t+1}^d is total investment after returns given by

$$\Omega_{t+1}^d = (1 + i_t) B_t^d + (1 + i_t^*) e_{t+1} B_t^{d*}$$

- The result of this optimization problem is an UIP condition

$$E_t e_{t+1} - e_t = i_t - i_t^* + \gamma \sigma^2 (w_t^{d*} + w_t^{d*,CB})$$

Central bank may intervene by selling or purchasing bonds in foreign currency

$$w_t^{d*,CB} = \chi_e(e_t - e_{t-1}) + \chi_T(e_t - e^T) + \chi_q q_t + \epsilon_{cb,t}$$

Inequality constraint

- "Shadow shock" ϵ^{SP}
- T^* maximal time horizon when the constraint is expected to bind
- The matrix M includes all IRFs to all values of ϵ^{SP}
- IRFs: $irf_\epsilon = \mu + v + \alpha M$

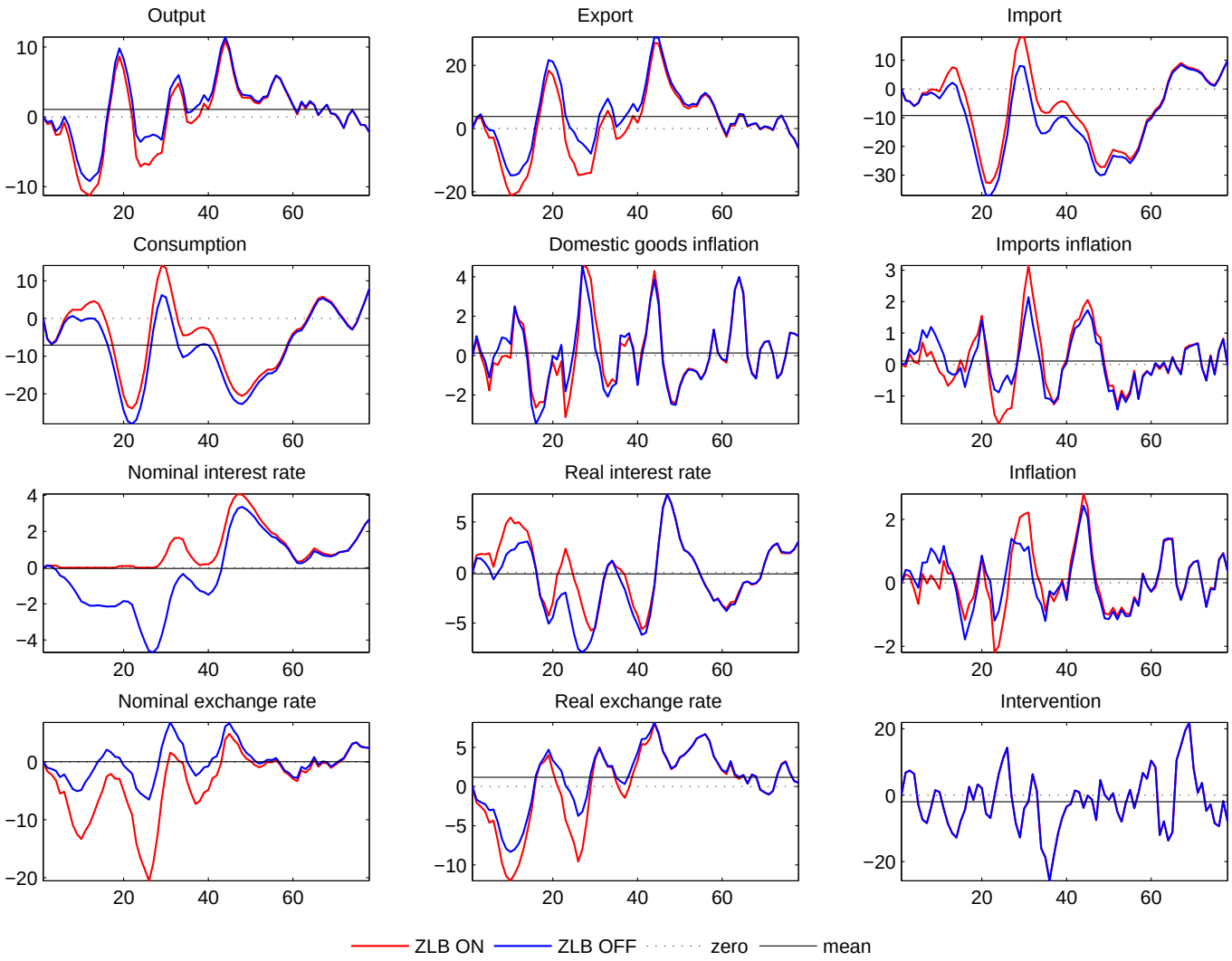
Inequality constraint

- Quadratic optimization

$$\alpha^* = \text{argmin}\{\alpha'(\mu^* + v^*) + \frac{1}{2}\alpha'(M^* + M^{*'})\alpha\}$$

$$\alpha'(\mu^* + v^* + M^*\alpha) = 0$$

Simulation ZLB



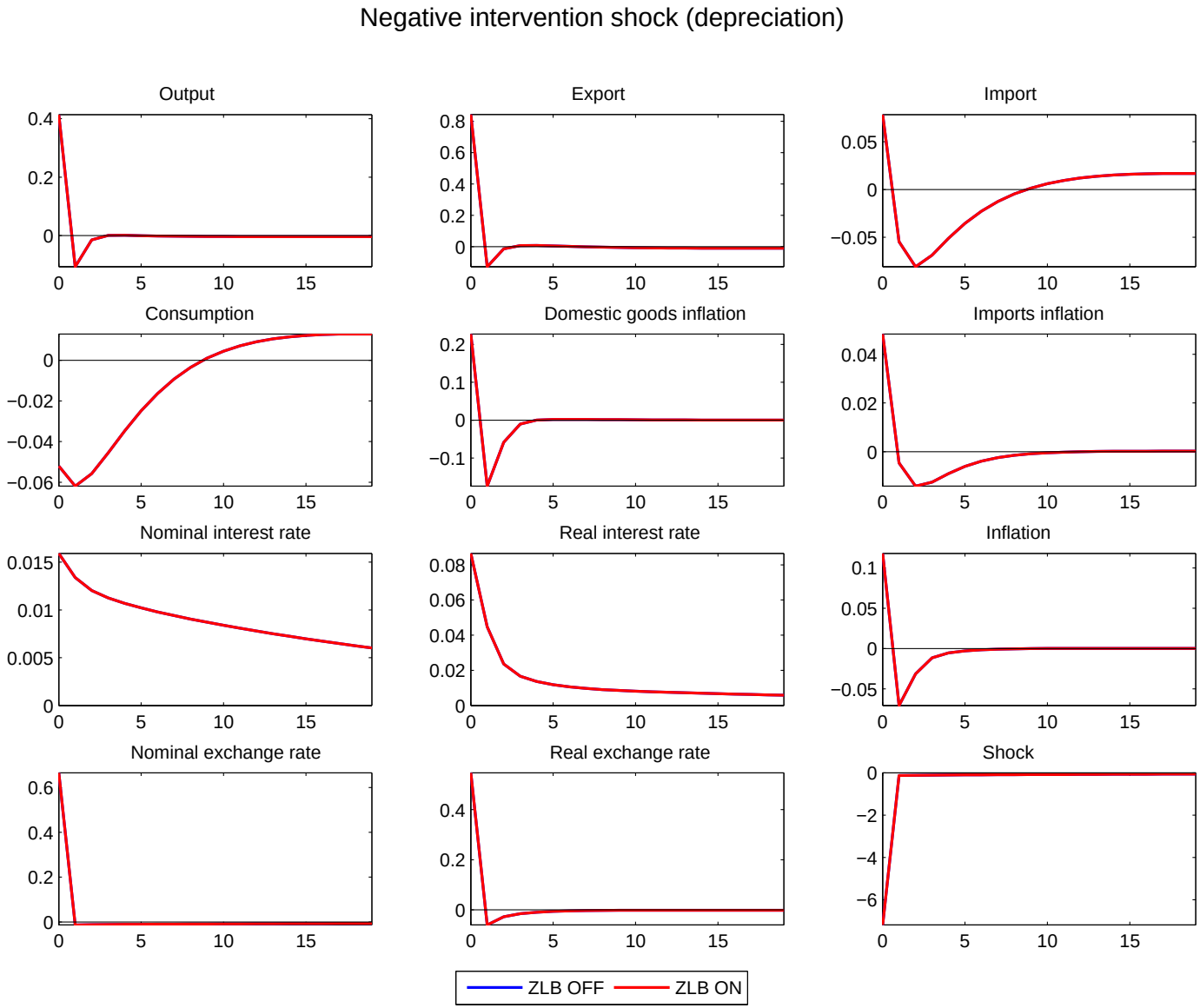
Intervention

Intervention of the central bank may be divided into two phases

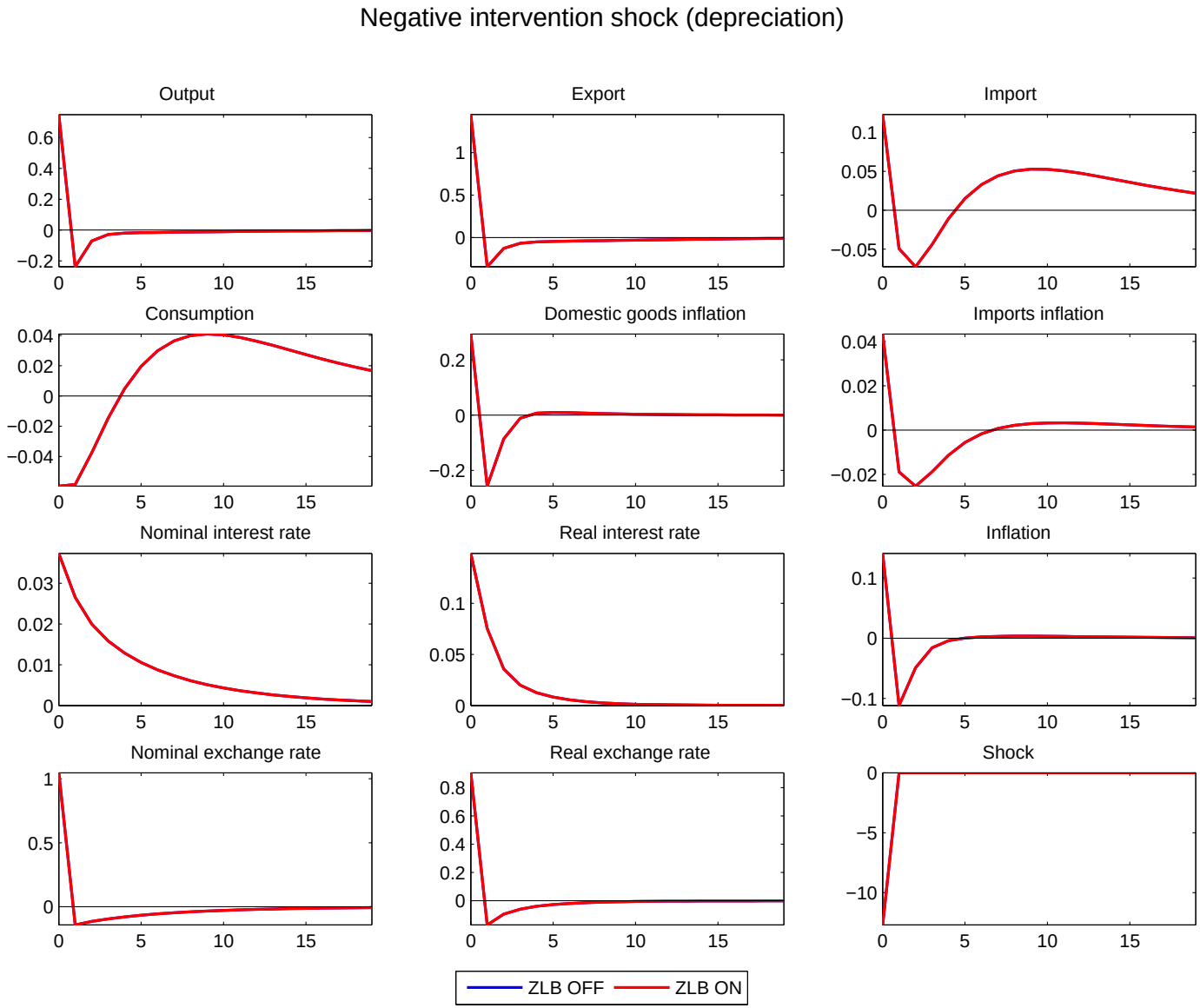
1. Depreciation of exchange rate on the new level
2. Exchange rate targeting – fixing the new level

Factors diminishing the impact of intervention – positive technology shocks, negative demand shocks, positive foreign capital inflows, positive imports shocks

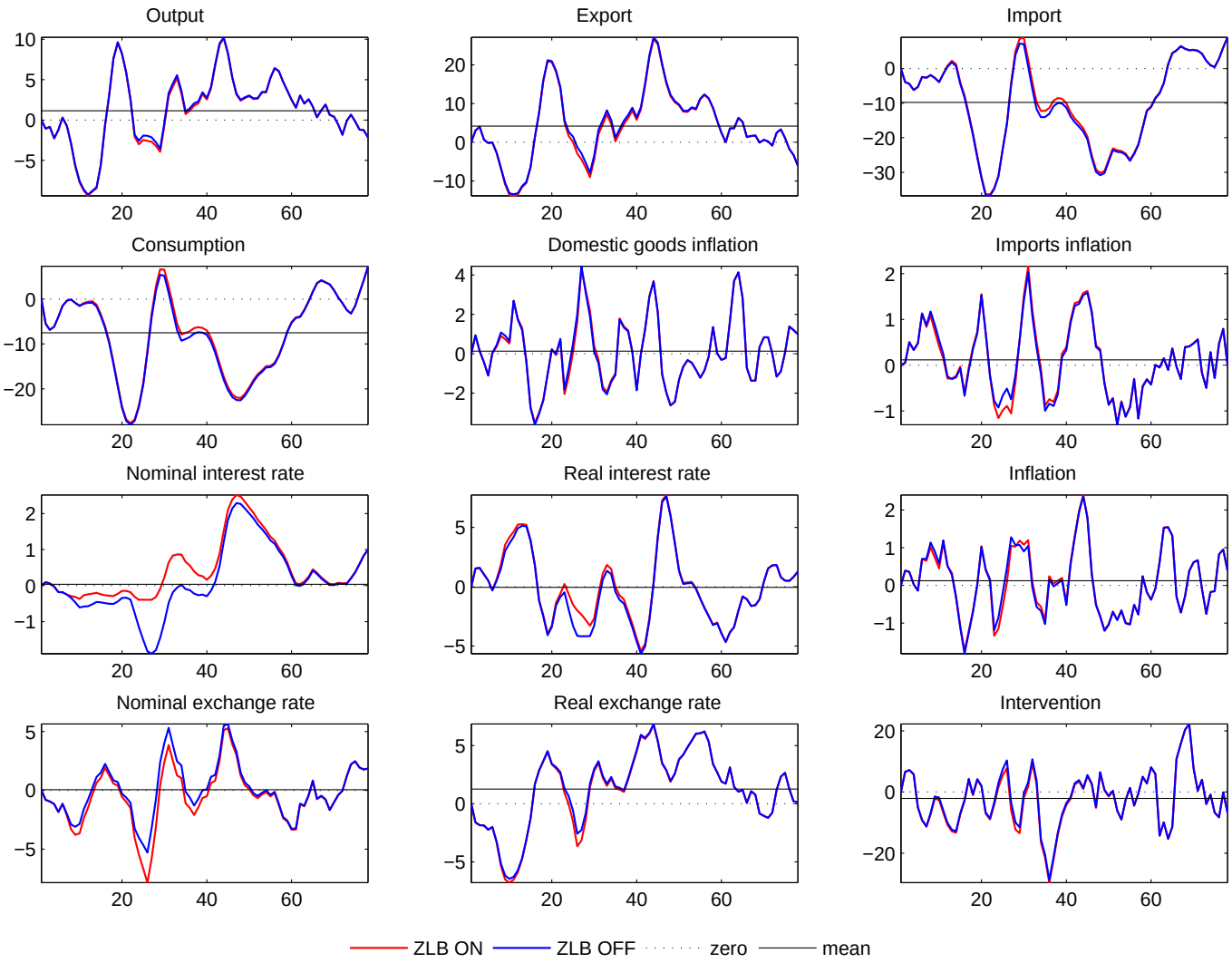
Intervention shock + exchange rate targeting



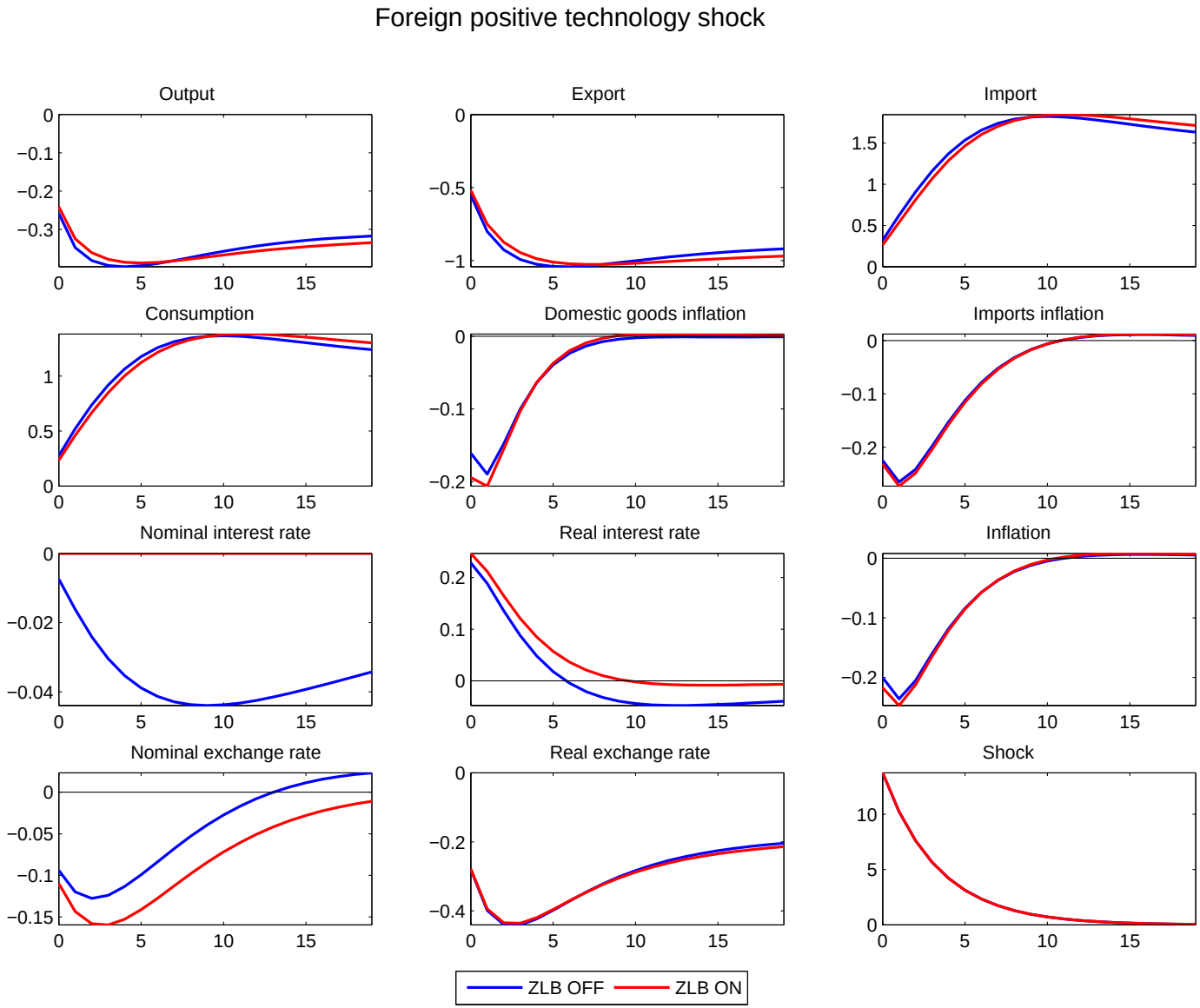
Intervention shock without exchange rate targeting



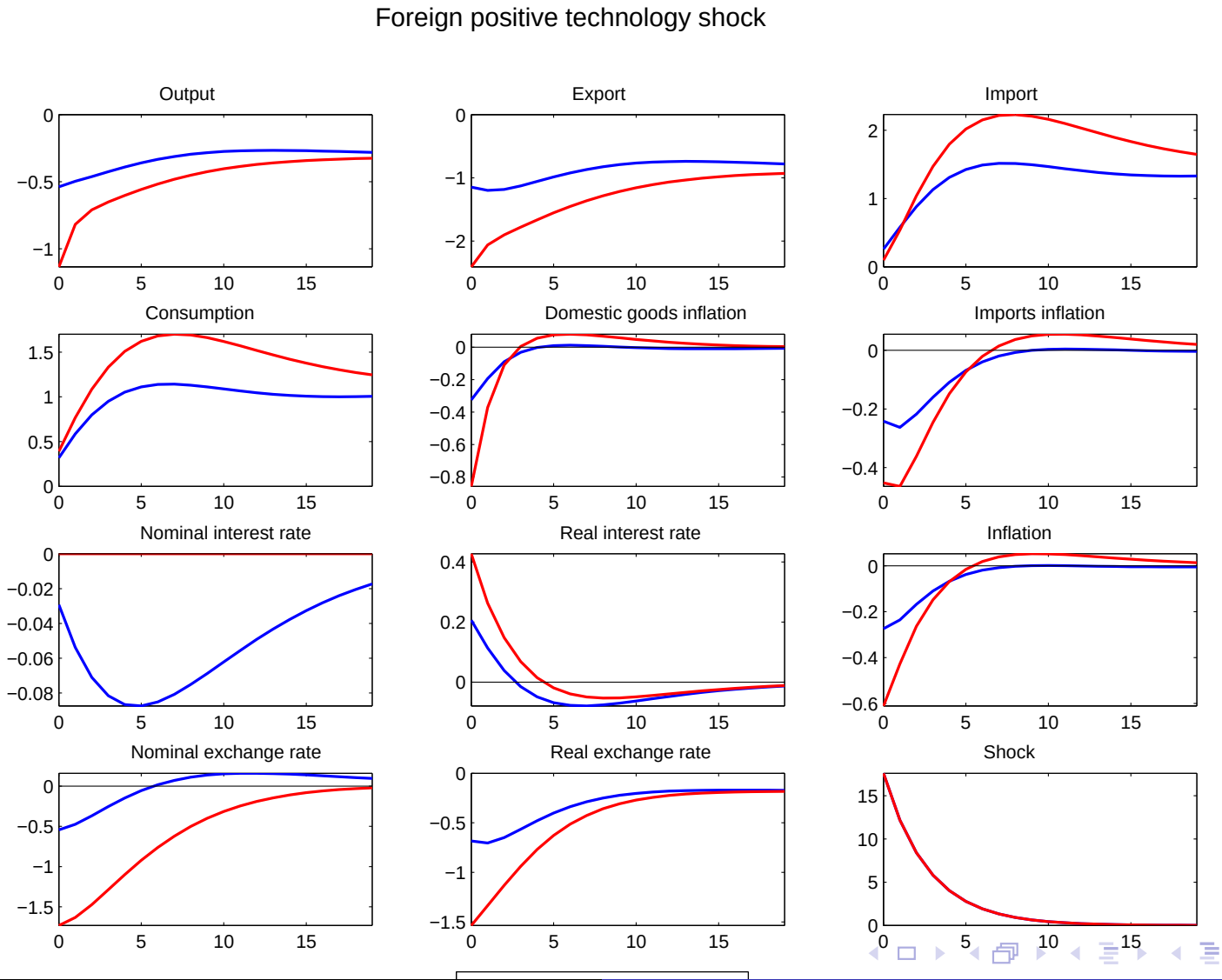
Simulation FX targeting



Positive technology shock + exchange rate targeting



Positive technology shock without exchange rate targeting



Conclusion

- Method provided by Holden and Paetz – relatively easy and intuitive way to modelling constraints in DSGE models
- Interest rate and exchange rate closely related $\Rightarrow$ exchange rate targeting is convenient candidate for monetary policy tool
- Exchange rate targeting absorbs the impact of zero interest rates
- The impact of the foreign technology shock is muted in case of FX rate targeting

Future work

- Comparison of different methods of modelling constraint
- Model with labour market, fiscal policy and foreign sector

Acknowledgements

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References

- HOLDEN, Tom. and Michael PAETZ. *Efficient simulation of DSGE models with inequality constraints* Discussion Paper 1612, School of Economics, University of Surrey. 2012
- JUSTINIANO, Alejandro. PRESTON, Bruce. *Monetary policy and uncertainty in an empirical small open economy model.* Working Paper Series WP-09-21, Federal Reserve Bank of Chicago, 2010.
- MALOVANÁ, Simona. *The Effectiveness of Unconventional Monetary Policy Tools at the Zero Lower Bound: A DSGE Approach.* Diploma thesis, Charles University, Prague. 2014.
- MONTORO, Carlo and Marco ORTIZ. *Foreign Exchange Intervention and Monetary Policy Design: A Market Microstructure Analysis.* Third draft. 2013.

Thank you for your attention.