# …under the IFT framework with an advanced FPAS system

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# Outline

- The CNB's inflation-forecast-targeting (IFT) framework
- The CNB's exchange rate commitment (Nov 2013–Apr 2017)
- The role of the FPAS in:
  - identifying the need to use an UMP instrument
  - choosing and calibrating the exchange rate instrument
  - guiding decision-making under the commitment
  - designing and timing the exit
- Summary and conclusions

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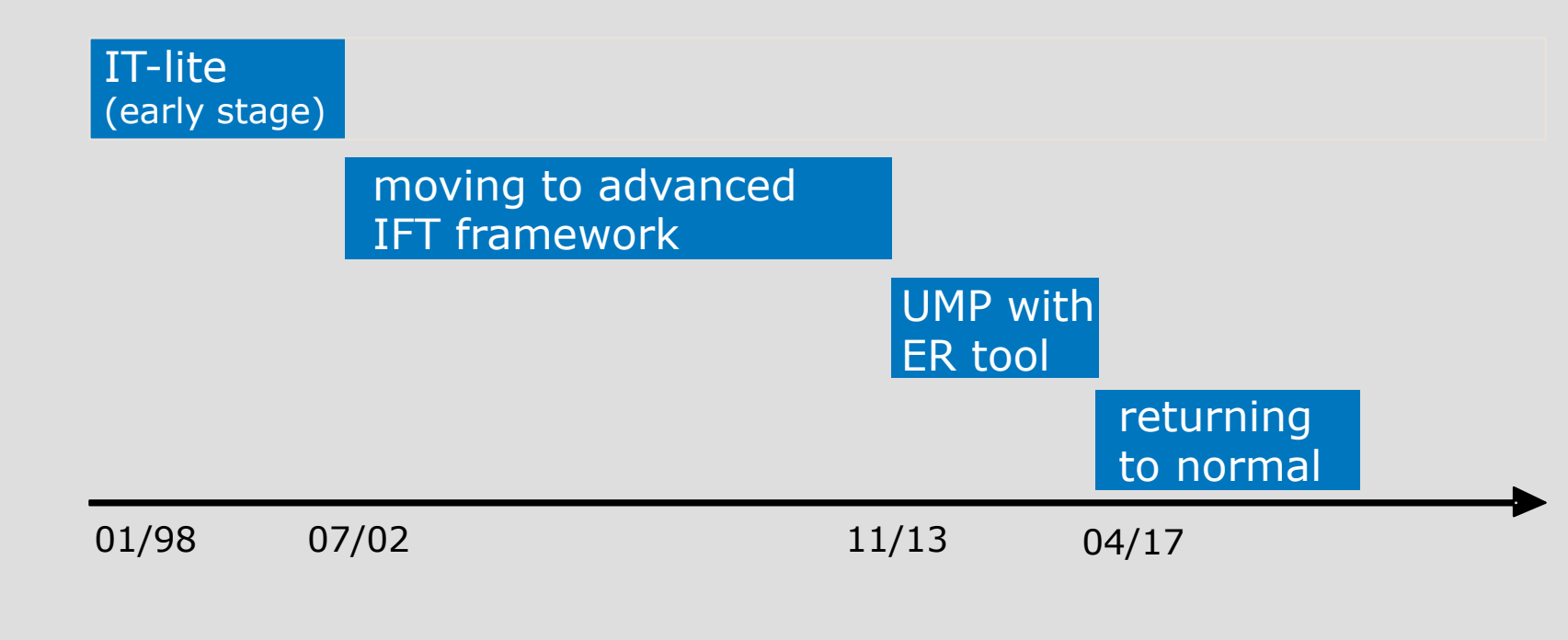
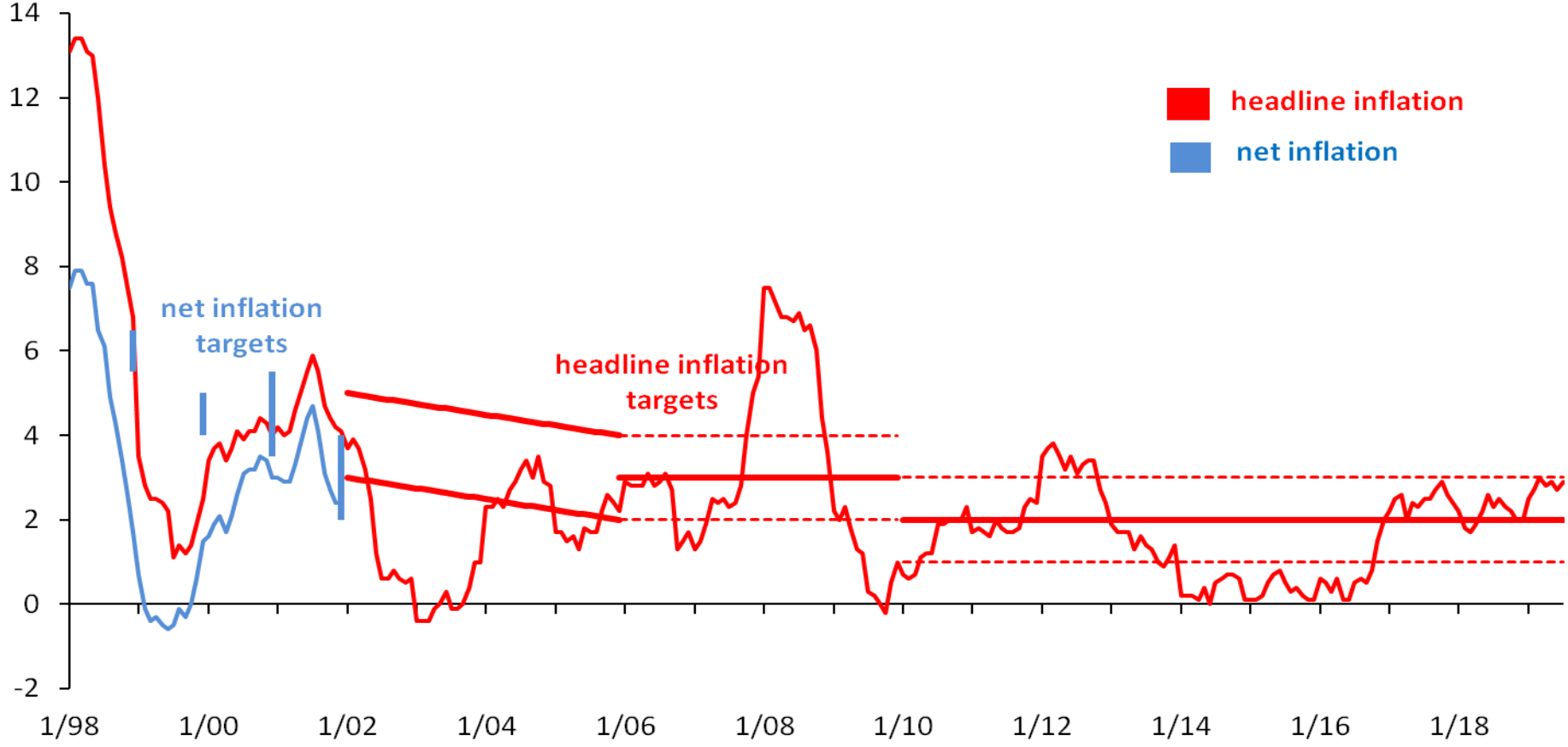
# Stages of the Czech I(F)T framework



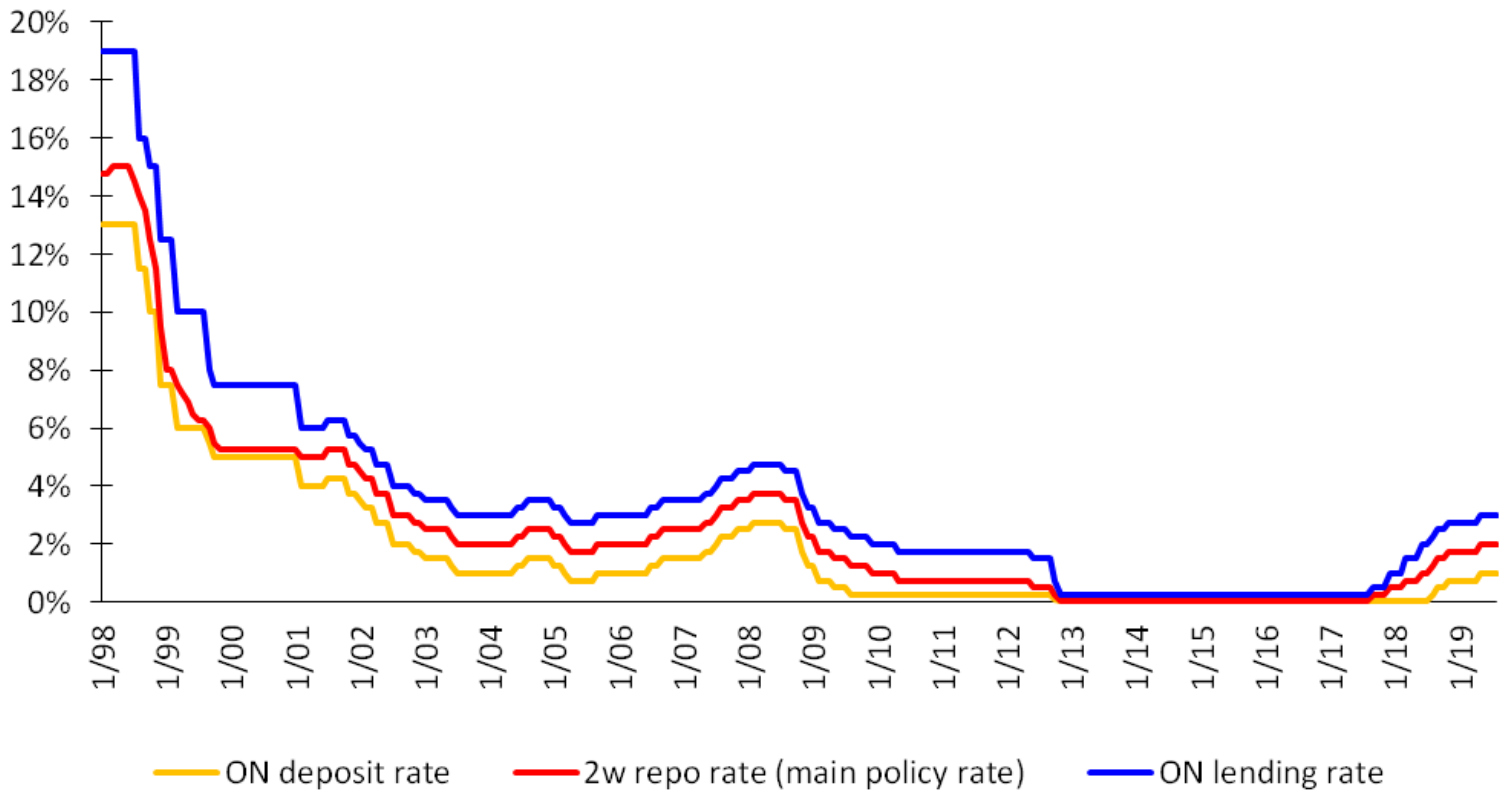

- Inflation targeting has been in place since January 1998.
- The advanced IFT framework, backed by a modern FPAS, was built in 2002–2008, i.e. before the Great Recession.
- It provided analytical foundations for conducting monetary policy at the ZLB, using the exchange rate as an UMP instrument, from November 2013 until April 2017.

# Inflation and targets



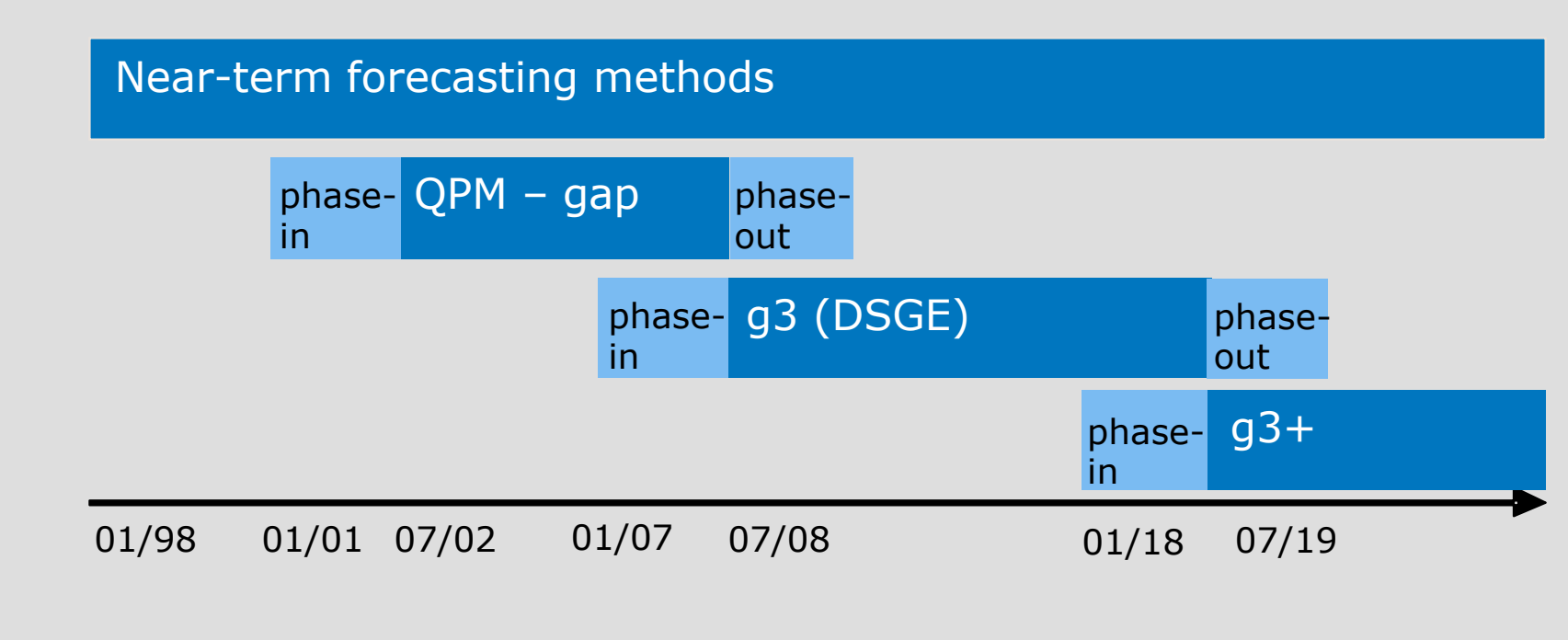

- Much of the disinflation process took place in the early stage.
- In 2014–2016, the Czech Republic was on the verge of deflation. Since 2017, inflation has slightly exceeded the 2% inflation target on average.

# Nominal policy rates



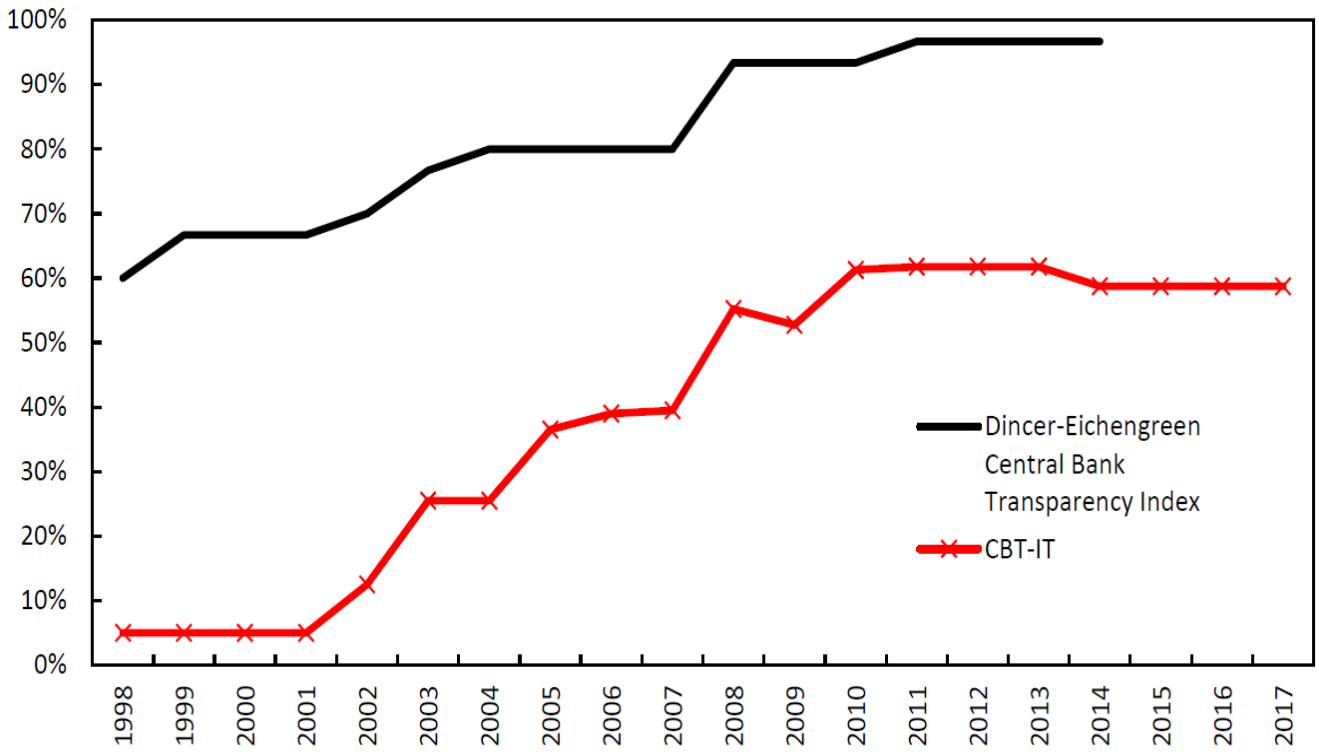

- Thanks to the disinflation process, nominal interest rates declined to relatively low levels in the early stage.
- From Nov 2012 until Sep 2017, rates were stuck at the ZLB.
- Policy normalisation has advanced more than in most other advanced European countries.

# Forecasting tools




- The key improvement took place in mid-2002, when a QPM-gap (forward-looking, general-equilibrium) model with endogenous monetary policy, exchange rate and expectations became the core forecasting model.
- The g3-DSGE model brought even more flexibility in terms of incorporating judgment and dealing with ZLB issues.

# Monetary policy transparency




*Source: Al-Mashat et al. (2018)*

- The advances in forecasting tools created a starting point for much greater monetary policy transparency in 2002–2008.
- The exchange rate tool was associated with a small (and temporary) decline in communication openness.

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# The CNB's November 2013 decision

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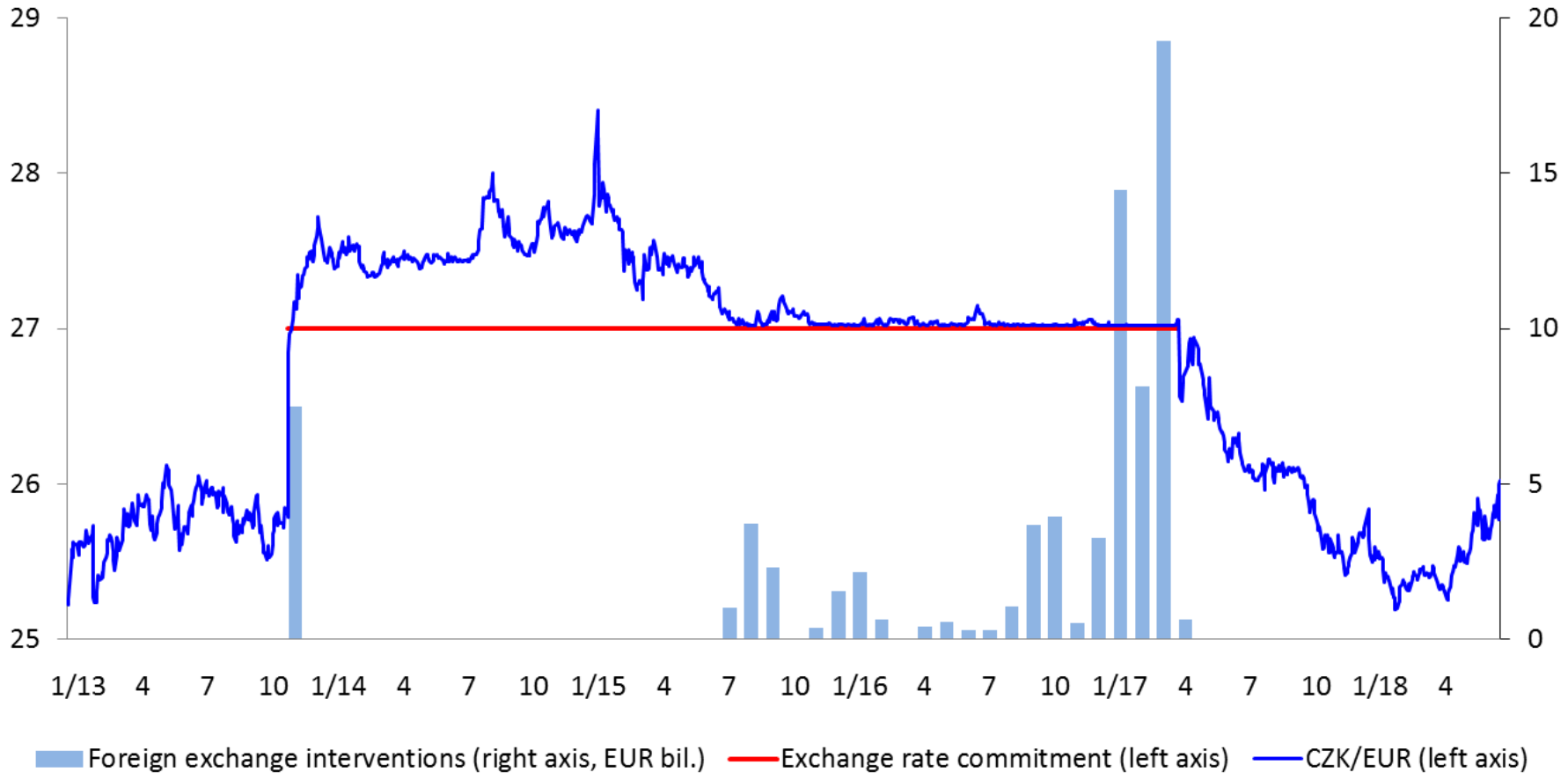
- The Board decided to start using the exchange rate as an additional instrument for easing the monetary conditions, stating that: *"The CNB will intervene on the FX market to weaken the koruna so that the exchange rate is close to CZK 27/EUR."*
- The exchange rate level was chosen to avoid deflation or long-term undershooting of the inflation target and to speed up the return to the situation in which the CNB would be able to use its standard instrument, i.e. interest rates.
- The exchange rate commitment was one-sided. This means that the CNB prevented the koruna from appreciating below CZK 27/EUR. On the weaker side of the CZK 27/EUR level, the CNB allowed the exchange rate to move according to supply and demand on the FX market.

# Exchange rate and CNB interventions




- The regime was successful implementation-wise.
- The volume of FX interventions jumped before the (transparent) exit on 6 April 2017. This contributed to smooth post-exit developments.

# Empirical effects of the commitment

| | Our approaches | | | | Independent approaches | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | g3 | Tonner et al. (2015) | SCM | GSCM | Svacina (2015) | Opatrny (2016) | Timko (2015) | Caselli (2016) (SCM) | Caselli (2016) (DiD) |
| CPI inflation (2014) | 1.2 | 1.2 | 0.1 | 0.2 | 0.5 | ±0 | 1.5 | ±0 | 0.5–1.0 |
| CPI inflation (2015) | 1.8 | 1.5 | 0.6 | 0.8 | | ±0 | 1.5 | 0.5 | |
| GDP growth (2014) | 1.2 | 0.8 | 0.3 | 0.4 | 0.8 | +0 | ±0 | | |
| GDP growth (2015) | 0.6 | 1.2 | 1.7 | 1.8 | | 2.0 | ±0 | | |
| Consumption growth (2014) | 1.4 | 0.3 | 0.4 | 0.4 | | | | | |
| Consumption growth (2015) | 0.9 | 1.0 | 1.5 | 1.7 | | | | | |
| Unemployment rate (2014) | | -0.3 | -0.2 | -0.1 | | -1.0 | | | |
| Unemployment rate (2015) | | -1.2 | -0.6 | -0.5 | | -1.8 | | | |

***Notes:*** g3 is the simulation with the g3 model; Caselli (SCM) is the result from Caselli (2017) using the synthetic control method; Caselli (DiD) is the result from Caselli (2017) using the difference-in-difference method.
Blank spaces mean that the study does not address the variable of interest; ±0 means that the study implies that the effect is both economically and statistically insignificant. Some results are not found in the tables or texts but were read from the graphs in the papers.

*Source: Brůha and Tonner (2017)*

- Most studies find a positive effect on inflation and/or economic growth, although the size of the estimated effects differs and some estimates are not statistically significant.
- The estimates may represent a lower bound for the actual effects of the exchange rate commitment (there is typically no role of a debt-deflation spiral in the models applied).

# Swiss vs. Czech case

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| | Swiss | Czech |
|---|---|---|
| MP regime | officially not inflation targeting<br>free float | inflation targeting<br>officially managed float |
| Reason for entry | sharp appreciation<br>export competitiveness | deflation risk, undershooting of inflation target |
| Design of "floor" | publicly announced<br>unlimited interventions | publicly announced<br>unlimited interventions |
| Duration of "floor" | 1,227 days | 1,246 days |
| Safe haven | yes, on global scale | no |
| Balance sheet constraints | quite important | none |
| Communication of exit | none | from very beginning |
| Characteristics of exit | discretionary, surprising | rule-based, telegraphed |
| Exchange rate after exit | abrupt appreciation | mild appreciation |
| Inflation after exit | deflation | slightly above target so far |
| Economy after exit | temporary slowdown, small unemployment increase | resilient (until current global slowdown) |
| Interest rates after exit | cut further below zero | normalisation to 2% |

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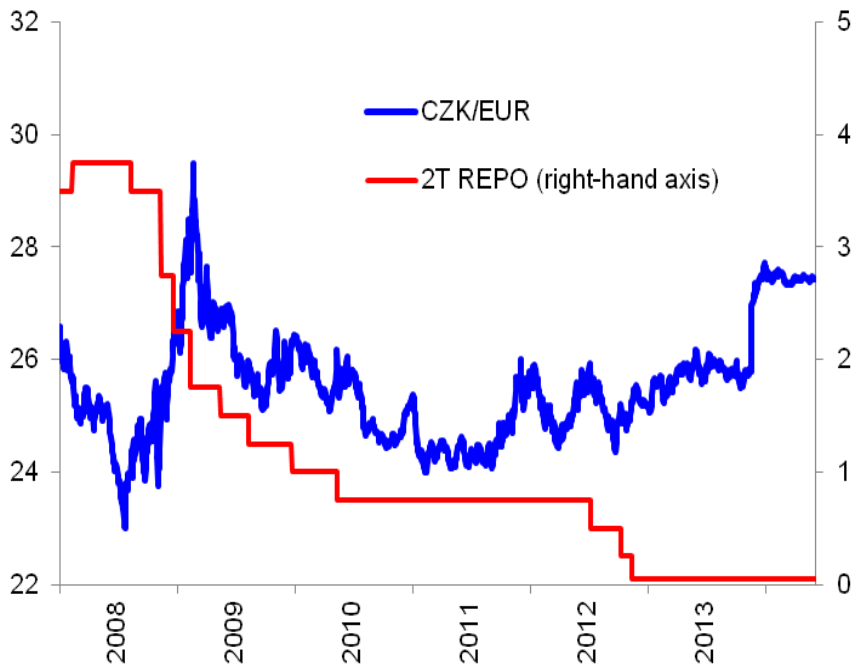
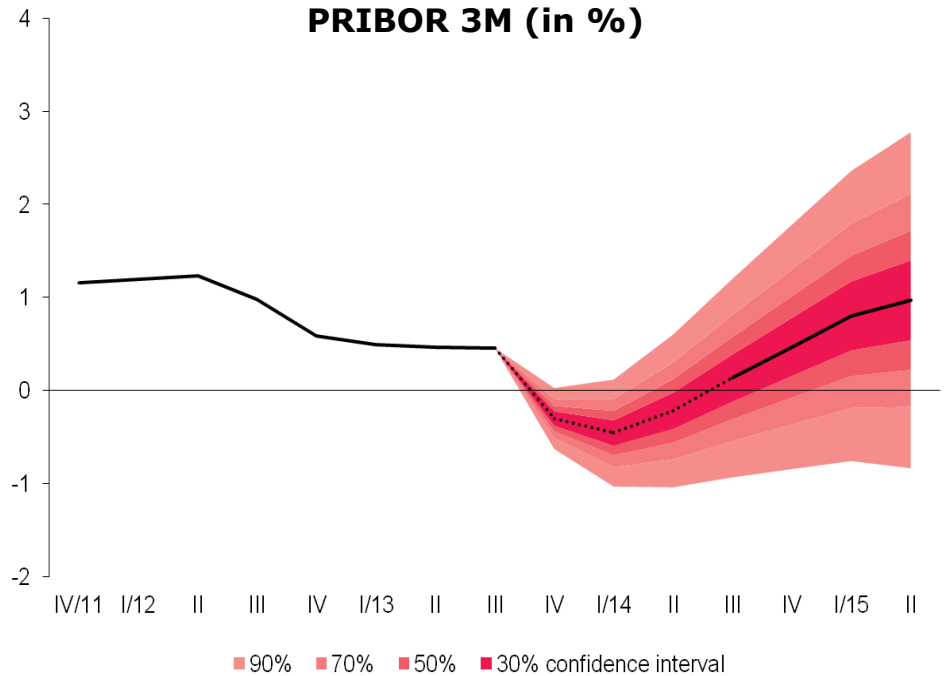
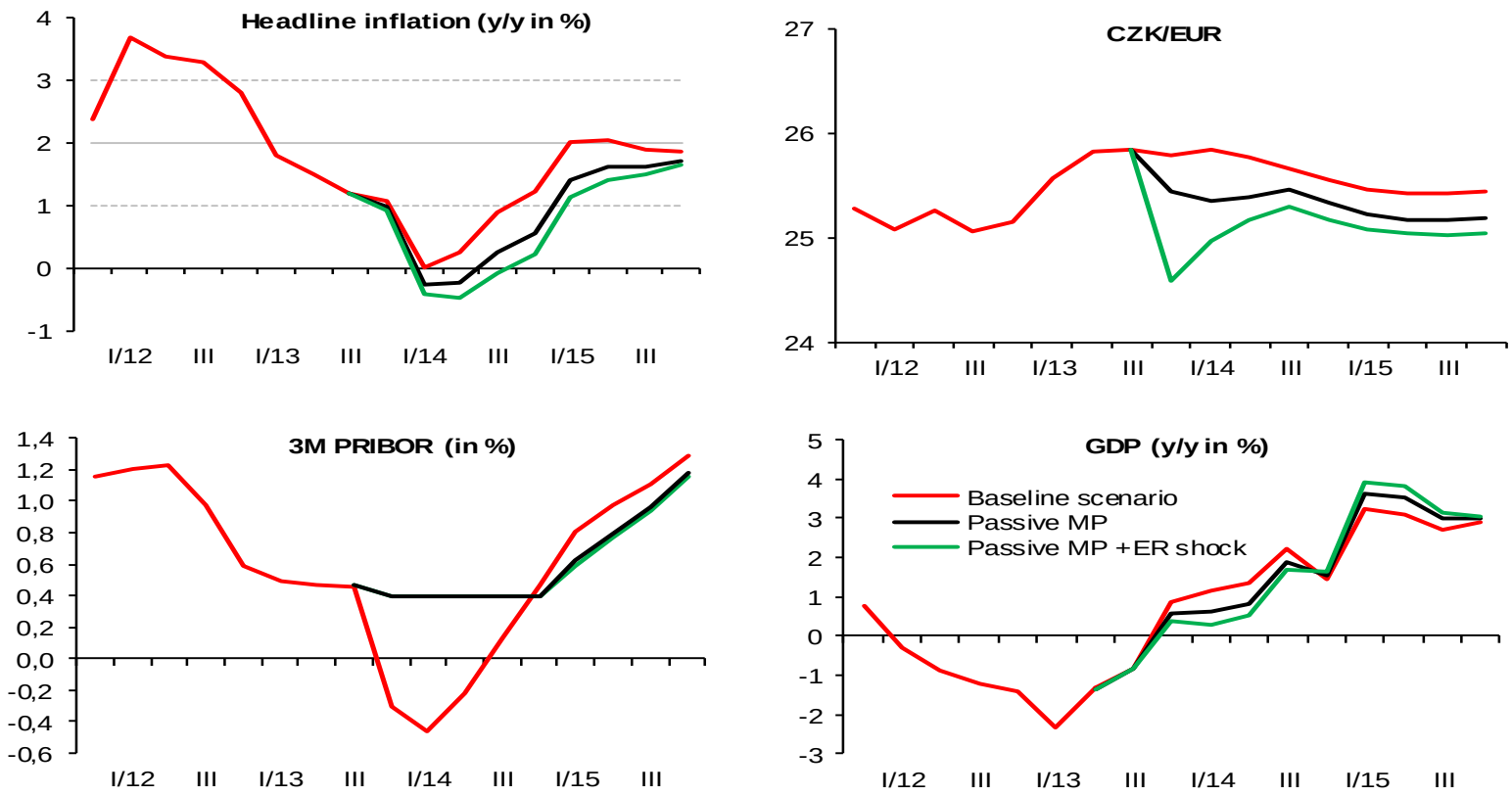
# The ZLB in the Czech case



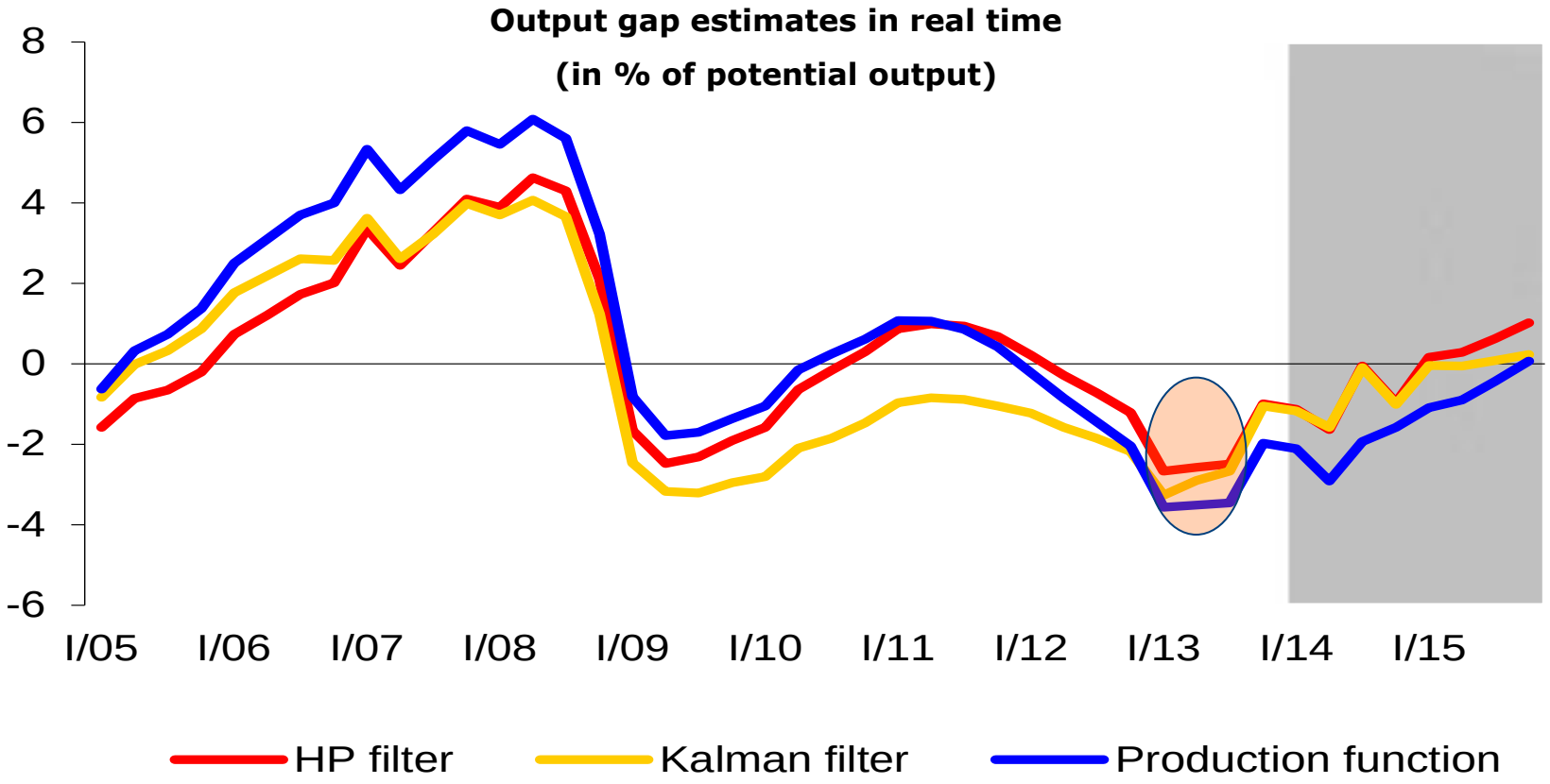

- The ZLB had been reached in November 2012.
- Consistent with the CNB's forecast in November 2013 was a significant decline in market interest rates well below zero, which would require four further policy rate cuts.
- The need to ease via a UMP instrument thus became obvious.

# Passive MP scenarios – November 2013




- The core model (g3) allowed us to simulate what-if scenarios of no policy response. These showed that passive monetary policy would have been associated with negative inflation, nominal exchange rate appreciation and weak economic recovery.
- Note: you should never show such scenarios as your baseline.

# Assessment of policy trade-offs




- Output gap estimates are not part of the core g3 model but are regularly presented to the CNB Board as a satellite analysis.
- With the output gap estimated at -2% to -4% in late 2013, there was no trade-off between the primary and secondary objectives. Monetary easing was desirable for both.

# Assessment of potential policy error

| Shocks to inflation | Monetary policy: Passive | Monetary policy: Active |
|---|---|---|
| Upward | "Lucky fool" | Fast exit |
| Downward | Deflation trap | Delayed exit |

- The "lucky fool" outcome would have been ideal but was beyond our control.
- A fast exit would have had costs in terms of reputation, but with a robust departure from the ZLB.
- The deflation trap was seen as very risky, and more probable than the simulations were suggesting.
- Delayed exit confirms that the MP easing was needed even more than originally thought…

- Assessing the risks of policy error is an important part of the CNB's FPAS (and gets even more important when uncertainty is large – you want to avoid "dark corners").
- The CNB perceived a risk of protracted deflation if monetary policy remained passive and expectations became unanchored (i.e. on top of the core model simulations).

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# The choice of instrument

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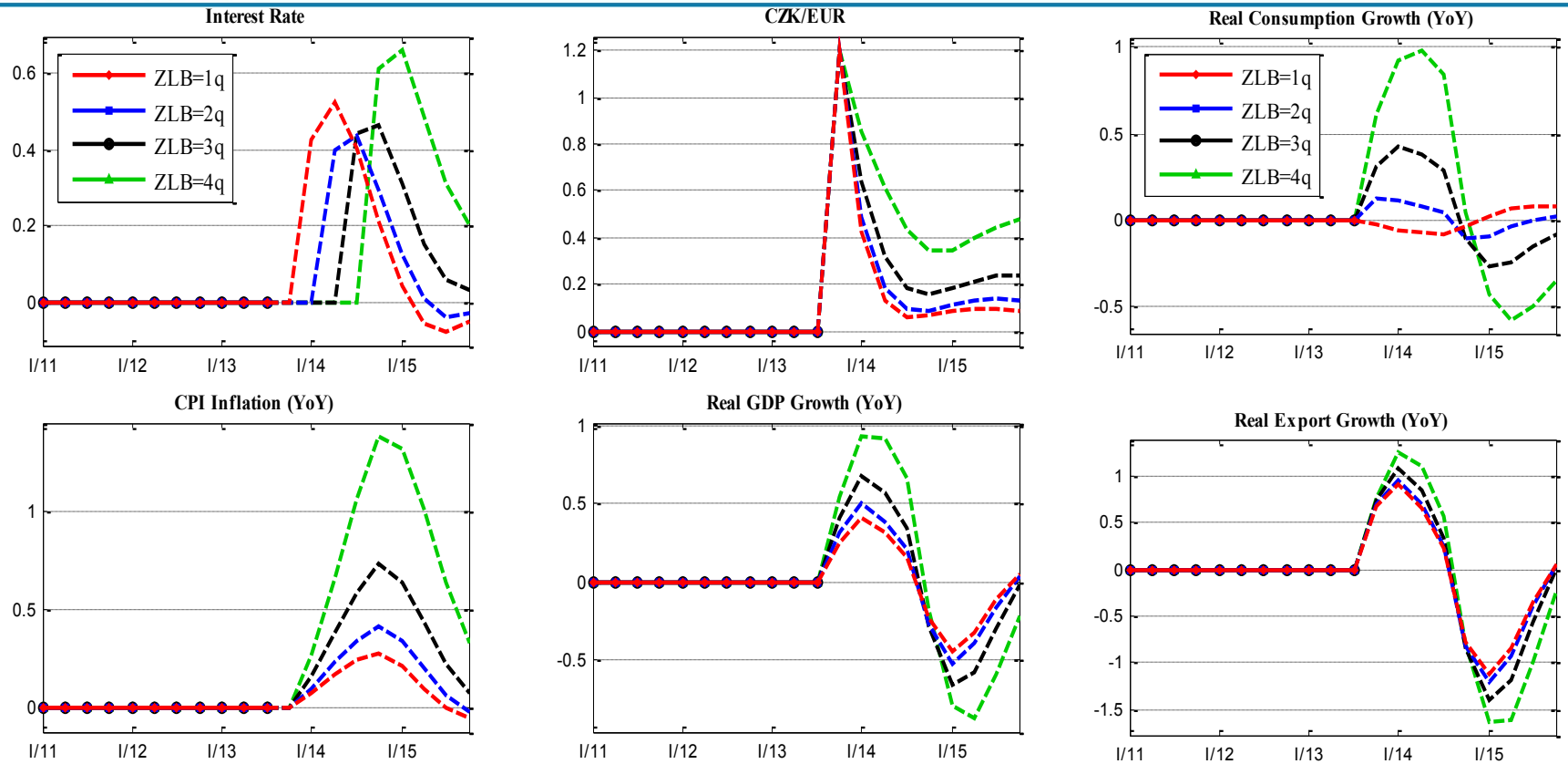
- The first round of contingency planning took place in 2009 (at that stage with limited input from regular FPAS tools).
- The debate intensified and became more specific in 2012.
- The full menu of available options was considered by the CNB.
- The choice reflected the specific Czech conditions:
  - Negative rates: besides general doubts, there were legal issues in CZ
  - Forward guidance: the traditional probabilistic guidance had been strengthened in November 2012: *"The rates will remain at zero level over a **longer horizon** until inflation pressures increase **significantly**"*
  - QE: the banking sector was saturated with liquidity and LT govt bond yields were already seen as low
  - Qualitative easing: shallow private bond markets, no market disruptions
  - Price level targeting: the IT regime had served the CNB well
  - FX interventions/exchange rate: viewed as clearly the most effective tool in a small open economy with no FX balance sheet mismatches

# Svensson's (2001) "Foolproof way"

- *"Announce an upward-sloping price-level target path.*
- *Announce that the currency will be devalued and that the exchange rate will be pegged to a crawling exchange-rate target.*
- *Announce that, when the price-level target path has been reached, the peg will be abandoned, either in favor of flexible price-level targeting…or in favor of flexible inflation targeting.*
- *Then, just do it.*

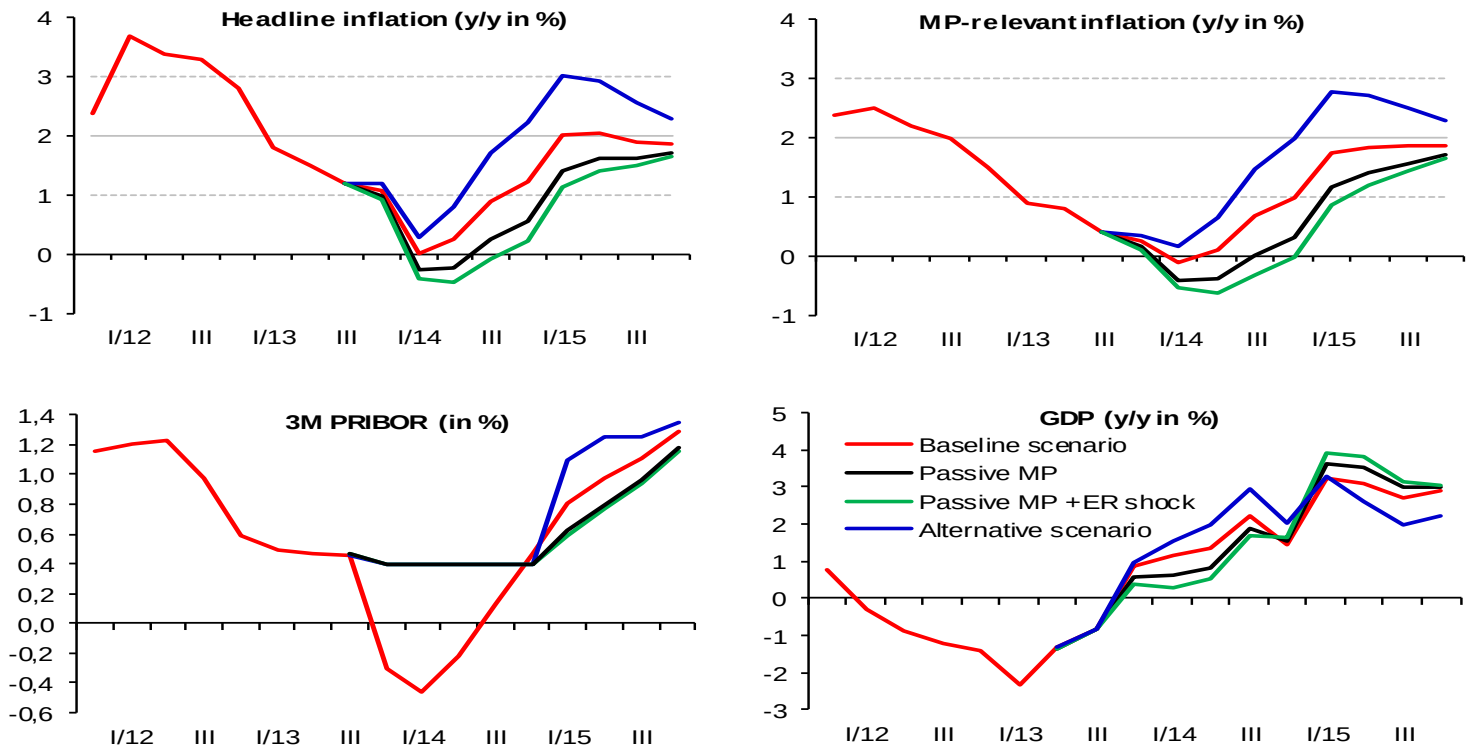
*This will jump-start the economy and escape deflation by a <u>real depreciation of the domestic currency</u>, a <u>lower long real interest rate, and increased inflation expectations."</u>*

# The ERPT in the ZLB situation




- The CNB's core model includes both the exchange rate and expectations channels of monetary policy transmission.
- Due to its structural nature, it is able to capture the changing strength of ERPT depending on the source of exchange rate movements and the ZLB constraint.

# November 2013 ER scenario




- The CNB's core model was used to find the appropriate level of the exchange rate commitment (a sequence of UIP shocks minimising a loss function with several objectives; a kind of grid-search for the "optimal" weights of these objectives).
- There was an implicit PLT element (allowing inflation to temporarily overshoot the 2% target) in the chosen scenario.

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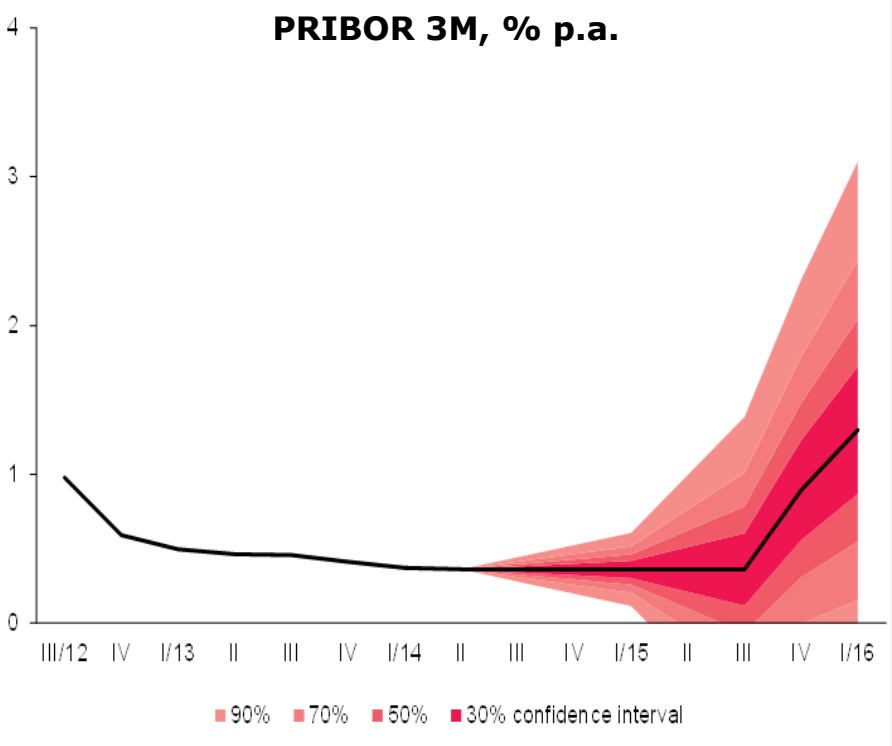
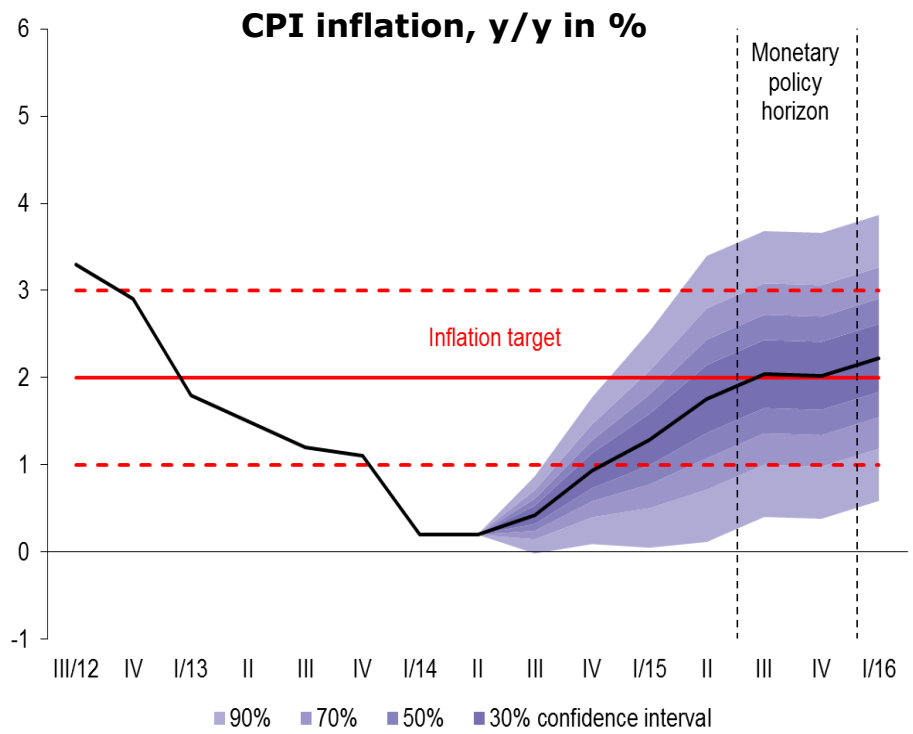
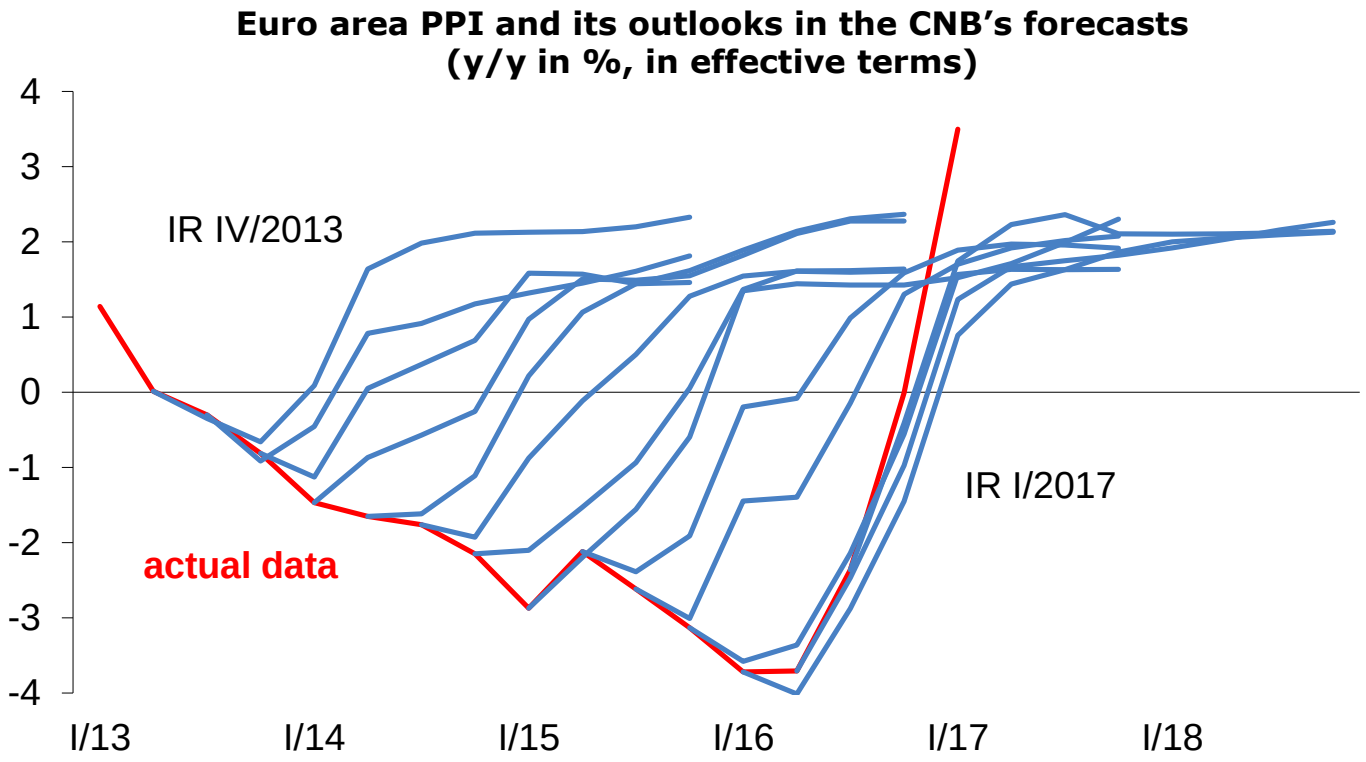
# Forecasts during the ER commitment



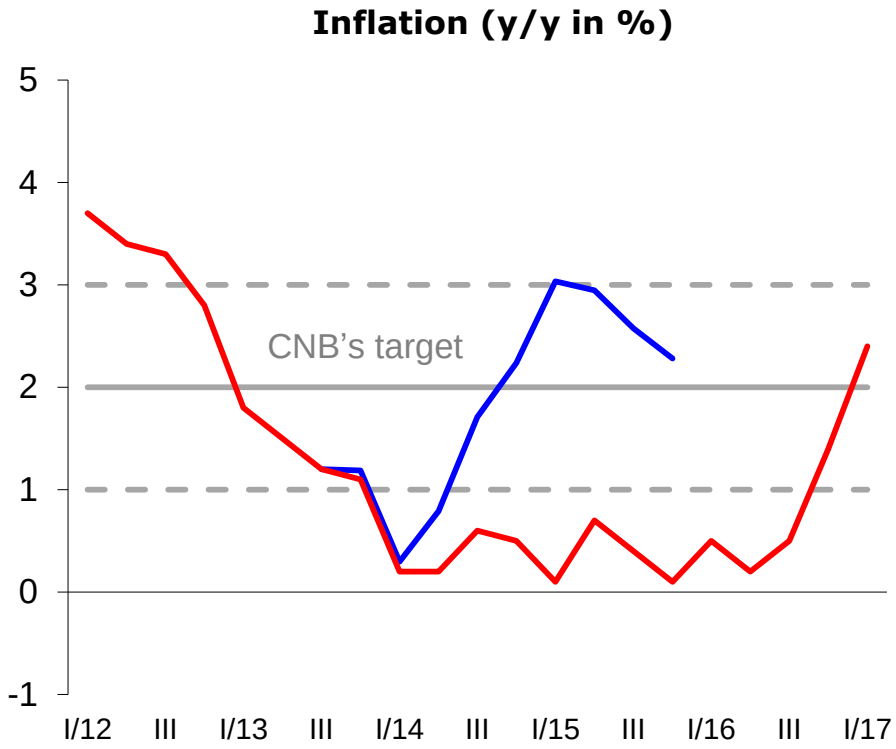

- The FPAS needed to be adjusted so that it would respect:
  - the ZLB at least until the assumed exit from the ER commitment;
  - using the exchange rate as a temporary instrument with two possible policy margins: (i) the expected length of the ER commitment; (ii) the level of the ER commitment (a smooth adjustment margin in principle but not in practice).
- Internally, the Board got scenarios for both policy margins.

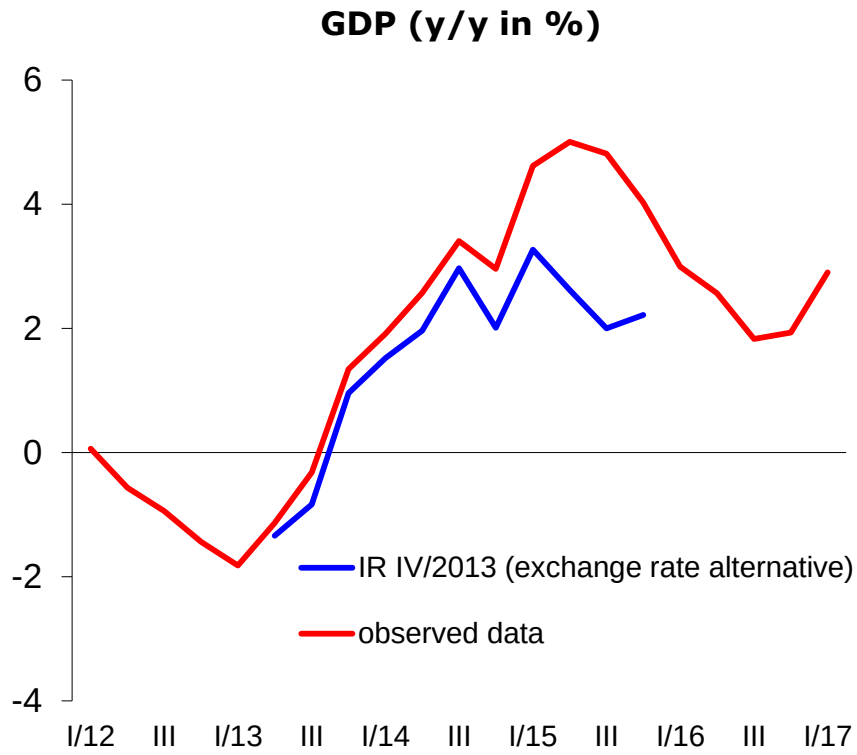
# External deflationary pressures




- External deflationary pressures proved to be much stronger and persistent than originally assumed (i.e. the "lucky fool" outcome proved unavailable from ex post point of view).
- The ECB responded by starting its QE and introducing negative policy rates.

# Ex ante scenario vs. ex post outcomes



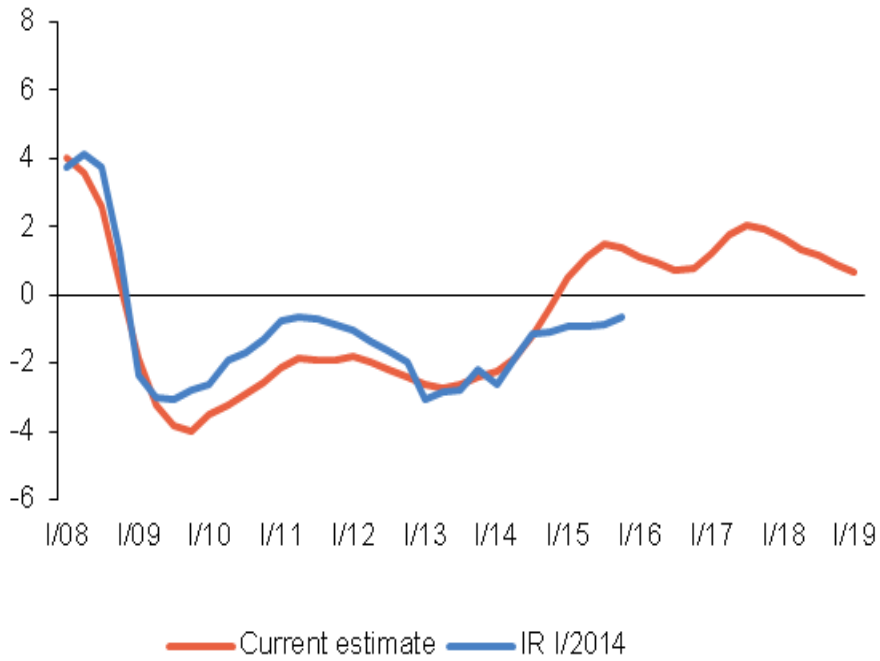



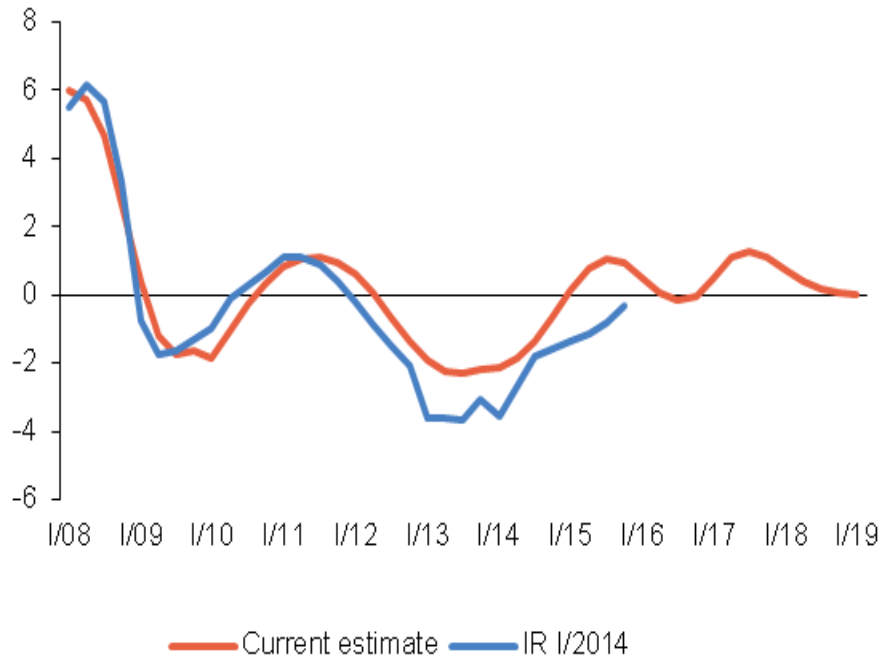

- Deflation was successfully avoided, but inflation stayed persistently low due to external factors (see above).
- Inflation thus exceeded the CNB's 2% target two years later than originally envisaged.
- On the other hand, the revival of economic activity was even faster than predicted in November 2013 (in 2015 fostered by EU funds and the effect of an oil price drop).

# Output gap

**Small structural model** **Production function approach**

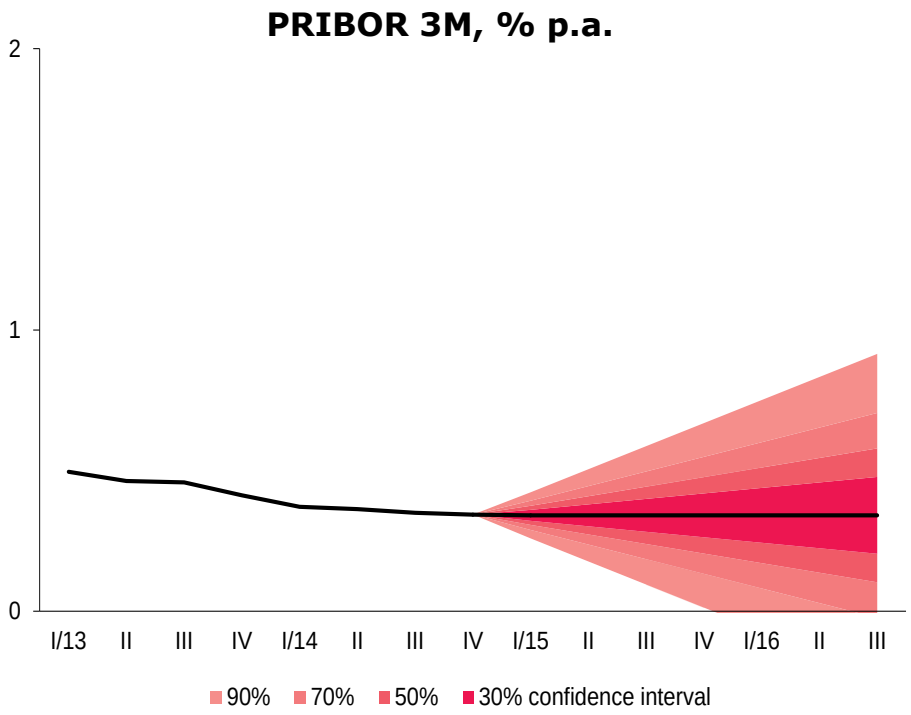
**(in % of estimated potential output)**

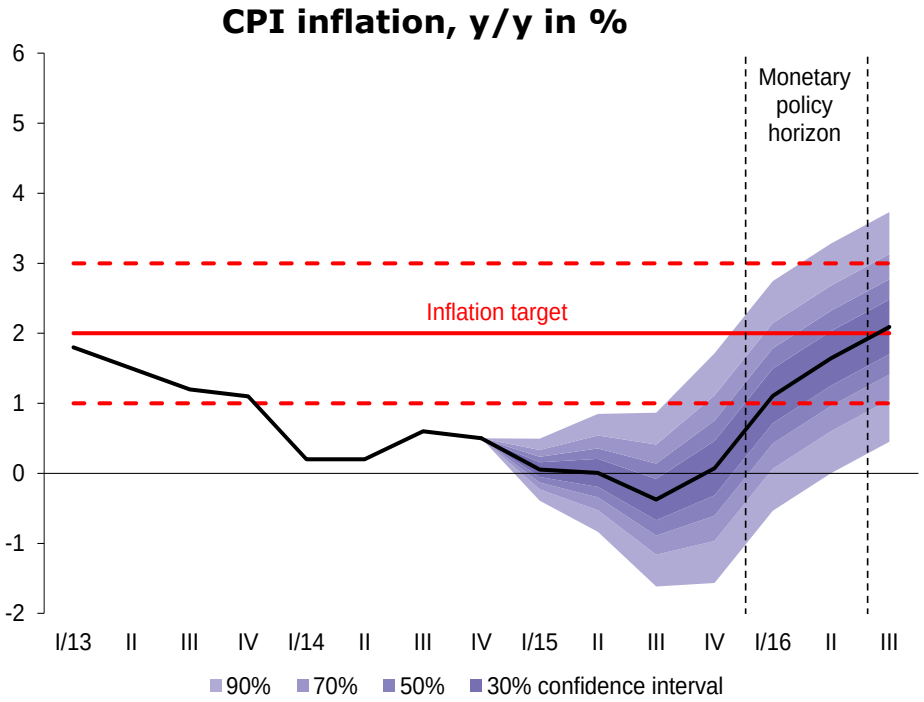



- The negative output gap closed in line with the original expectations, or even slightly faster.
- The secondary objective of monetary policy was thus achieved fairly quickly under the exchange rate commitment.
- Significant policy trade-offs thus arose at the turn of 2015 (with the global fall in energy prices).

# Inflation Report I/2015




- This was the most challenging period for the whole FPAS and policy framework under the ER commitment:
  - the assumed exit had to be postponed beyond the policy/ forecasting horizon;
  - even with this, inflation was returning to the target at the very end of the forecasting horizon.

# IR I/2015: impact of low oil prices

| | Inflation (pp) | Real GDP (pp) | Real consumption (pp) | Oil price (USD/barrel) |
|---|---|---|---|---|
| I/15 | -0,5 | 0,3 | 0,2 | -50,7 |
| II/15 | -0,9 | 0,6 | 0,5 | -47,3 |
| III/15 | -1,2 | 0,9 | 0,8 | -44,3 |
| IV/15 | -1,3 | 1,2 | 1,1 | -42,1 |
| I/16 | -0,6 | 1,0 | 1,0 | -40,1 |
| II/16 | -0,1 | 0,7 | 0,8 | -38,2 |
| III/16 | 0,4 | 0,3 | 0,5 | -36,5 |
| IV/16 | 0,6 | 0,1 | 0,3 | -35,2 |

- This factor was assessed using an extended version of the g3 model (compared to a hypothetical scenario of an oil price of USD 100/b).
- It confirmed that the oil price drop was a major positive supply-side shock, lowering inflation and boosting economic growth considerably (even at the ZLB, provided that inflation expectations remained well anchored).

# Dealing with the policy trade-off

- *"The CNB's analyses confirm that the slump in oil prices is a positive supply shock which will boost Czech economic growth in 2015. In line with its previous communication, the CNB will not respond to the first-round effects of this shock on the price level. This means it is prepared to tolerate inflation moving temporarily close to, or even slightly below, zero this year. Next year, however, the first-round effects of this shock will unwind, and it remains the CNB's intention to ensure that inflation returns towards the 2% target. Therefore, it will be important to prevent any second-round effects of the current slump in energy commodity prices, which would be reflected in inflation in the longer run.*
- *The Bank Board therefore again stated that the level of the exchange rate commitment could be moved. …The Bank Board also stated that the CNB would not discontinue the use of the exchange rate until the monetary policy horizon, i.e. before the second half of 2016."*

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# Communication of the future exit design

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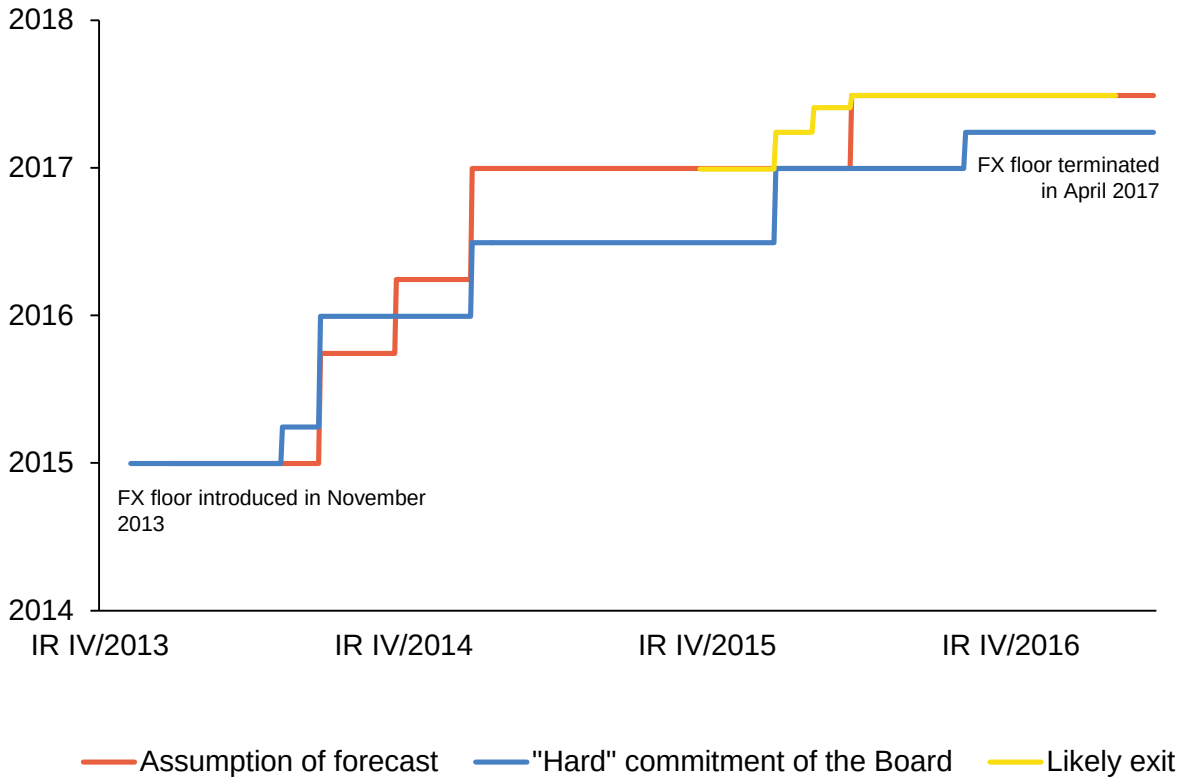
- This communication started almost from the beginning.
- Ex post, it signalled the subsequent reality quite well (see the quotes below from 2014), with increasing precision over time:
  - *"The timing of the exit assumed in the forecasts is communicated very transparently (i.e. via the IR path).*
  - *The Board may (and does) deviate from the forecast in its assessment and forward guidance due to perceived risks.*
  - *Exit = return to the standard inflation targeting framework with interest rates as the main instrument, combined with managed floating.*
  - *It can have a one-off character, or be more gradual (with backstops).*
  - *Exit will come only once monetary policy tightening is needed, and this need is sufficiently strong and durable to avoid hitting the ZLB again.*
  - *There is a trade-off between a 'velvet exit' and a robust one."*

# Communication of the exit timing

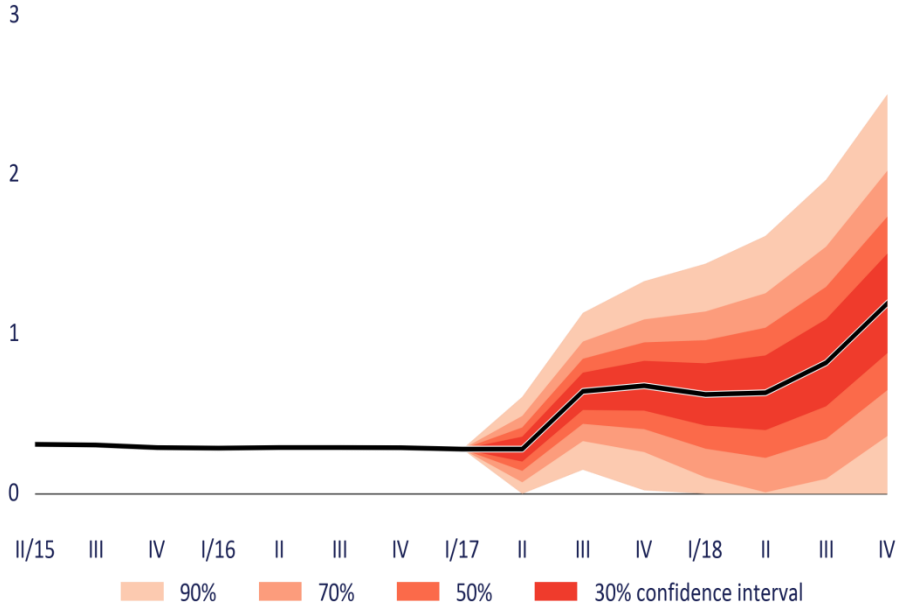



- As a policy instrument, the CNB Board primarily used a “hard commitment” specifying the minimum duration of the “floor”.
- The CNB also provided information on the exit date expected or considered likely by the Board, as well as on the timing of the exit assumed in the forecast.

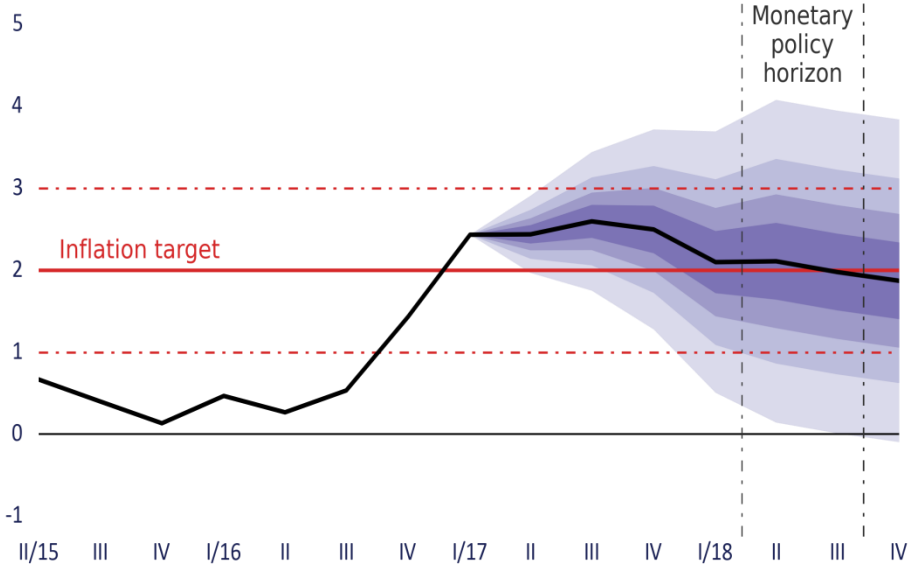
# The FPAS's role in the timing of the exit

- Internal scenarios with a different exit timing: a later (earlier) exit would imply a larger (smaller) inflation target overshooting, rather more (less) overheating of the real economy and faster (slower) subsequent policy normalisation.
- Internal scenario with fully endogenous interest rates and exchange rate = prospective baseline for post-exit period (see Inflation Report II/2017 below).

**PRIBOR 3M, % p.a.**




**CPI inflation, y/y in %**



# Assessment of potential policy error

| Shock to inflation | Exit: soon | Exit: later |
|---|---|---|
| upside | "Lucky fool" | Overdue exit |
| downside | Premature exit | Thougtful exit |

- Similar to the entry decision.
- A version of mini-max decision making (i.e. a decision based not on the mean value, but on avoiding the worst possible outcome).
- Some people now criticise the CNB for an overdue exit ex post, but this was in fact a rational choice ex ante.

- The main uncertainty was seen in post-exit exchange rate developments (the g3 model was used to prepare internal sensitivity scenarios; publication resumed in IR I/2018).
- With the benefit of hindsight, the risk of a premature exit was successfully avoided (the exit timing was appropriate, the exchange rate appreciation afterwards was gradual).
- This laid the ground for subsequent policy normalisation.

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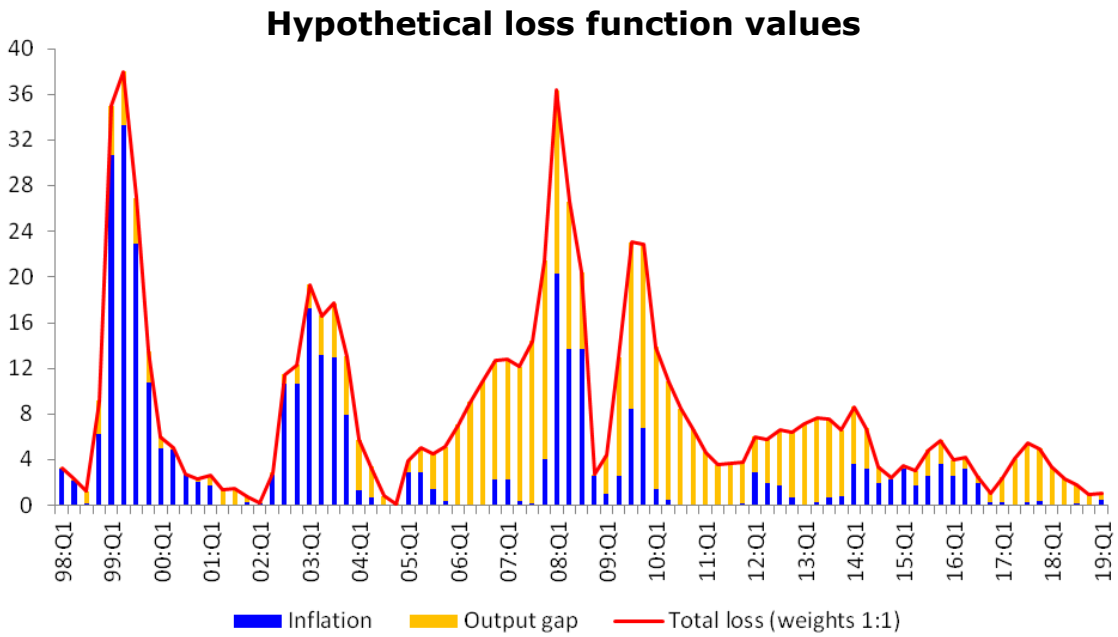
# Summary and conclusions (i)




- The use of UMP was definitely challenging (and very unpopular with the public).
- But the fulfilment of MP's stabilisation role since 2014 has actually been better than ever before.
- Note that the moderate overshooting of the inflation target since 2017 has been a minor issue in this assessment (but was an important feature of the entry and exit design).

# Summary and conclusions (ii)

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- The CNB's FPAS in its current modern form started to be developed around mid-2002.
- At that time, no one expected that it would have to serve under the ZLB constraint to guide unconventional monetary policy.
- But it helped – with modifications – to guide decision-making in this unprecedented situation:
  - at the time of entry in identifying the need to use an UMP instrument and choosing and calibrating that instrument;
  - during the exchange rate commitment, including the challenging period of policy trade-offs at the turn of 2015;
  - before the exit by helping to find the appropriate timing.
- The policy normalisation since Sep 2017 (current main policy rate at 2%) creates room for manoeuvre in the current challenging international situation.