Applied Macroeconomic Modeling – About Azerbaijan

OGResearch

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Point of this block

We want to understand what happened in Azerbaijan because:

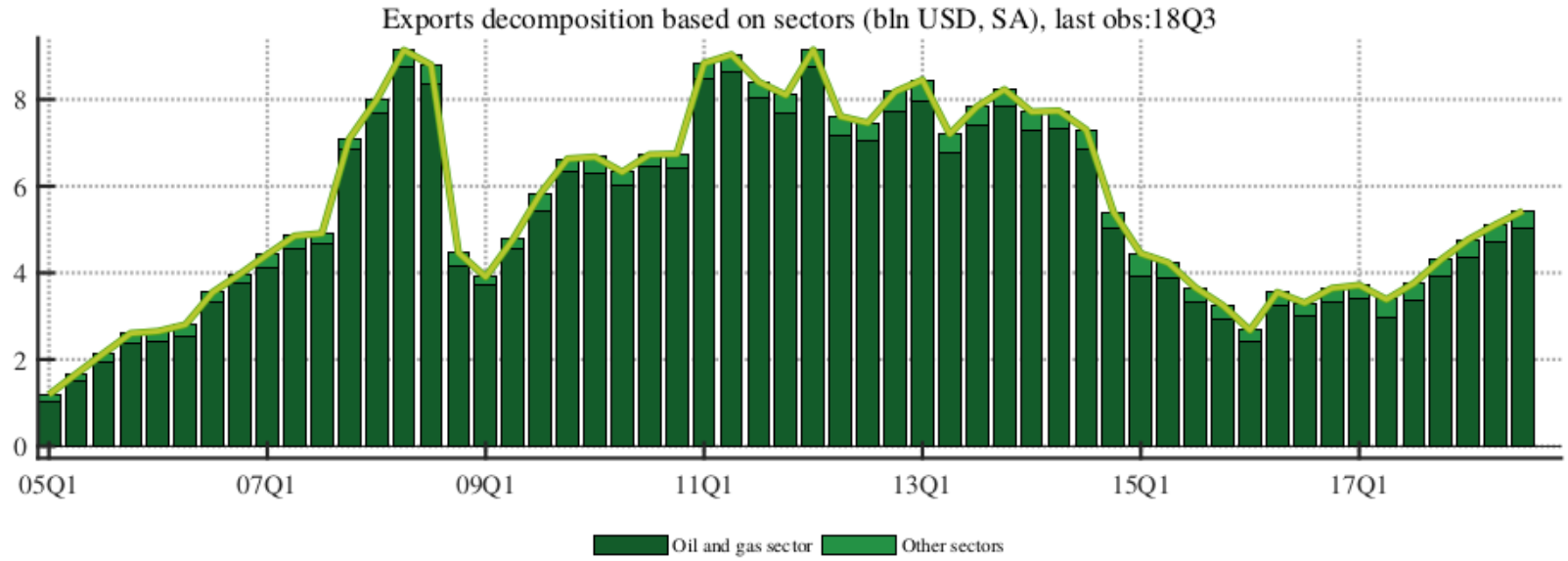
- We want to tailor the QPM model to fit Azeri economy:
  - incorporate key transmission mechanisms
  - choose correct parameters, including steady-state parameters
- We want to build understanding of what happened so we can choose the right shocks

Azerbaijan before 2014

- Azeri economy in one word?

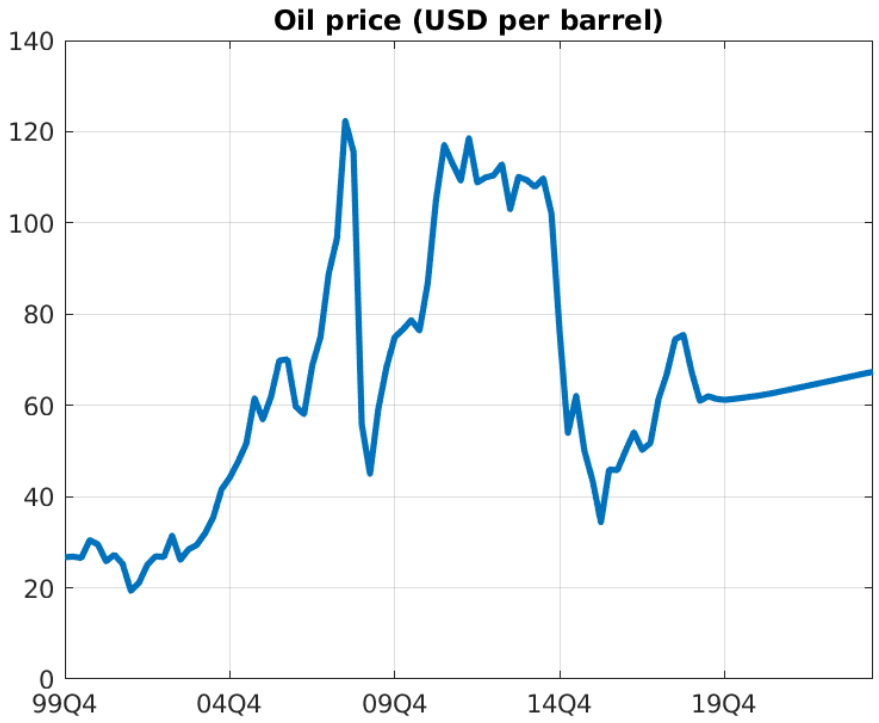
Export decomposition

- Oil dominates exports, real economic activity, …



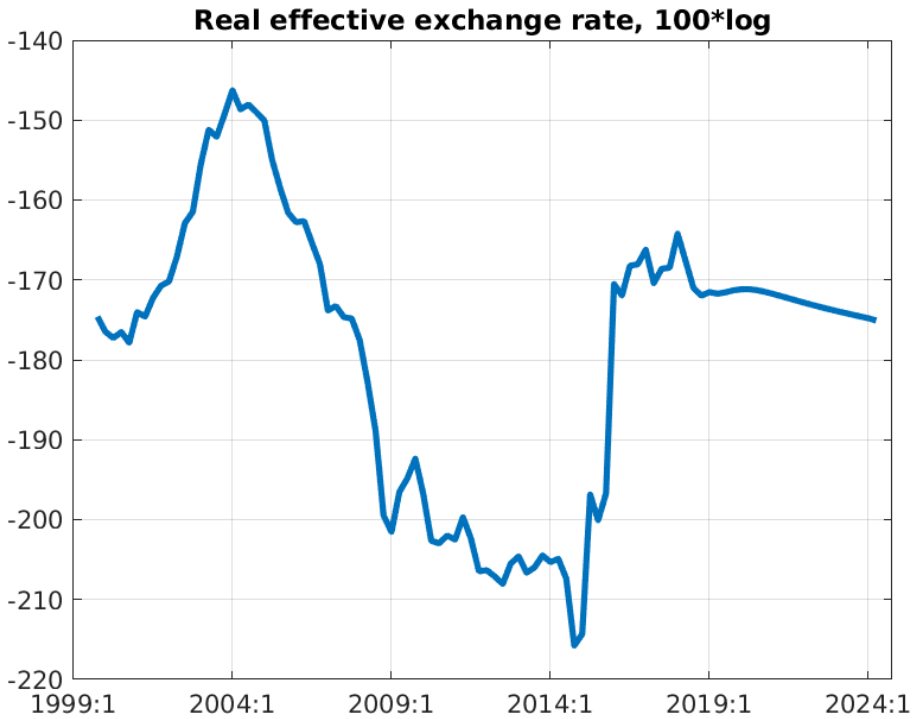
Oil prices have large impact

- Oil prices strongly influence GDP growth, real exchange rate, exports, FX reserves, ...
- Important to understand the transmission channels



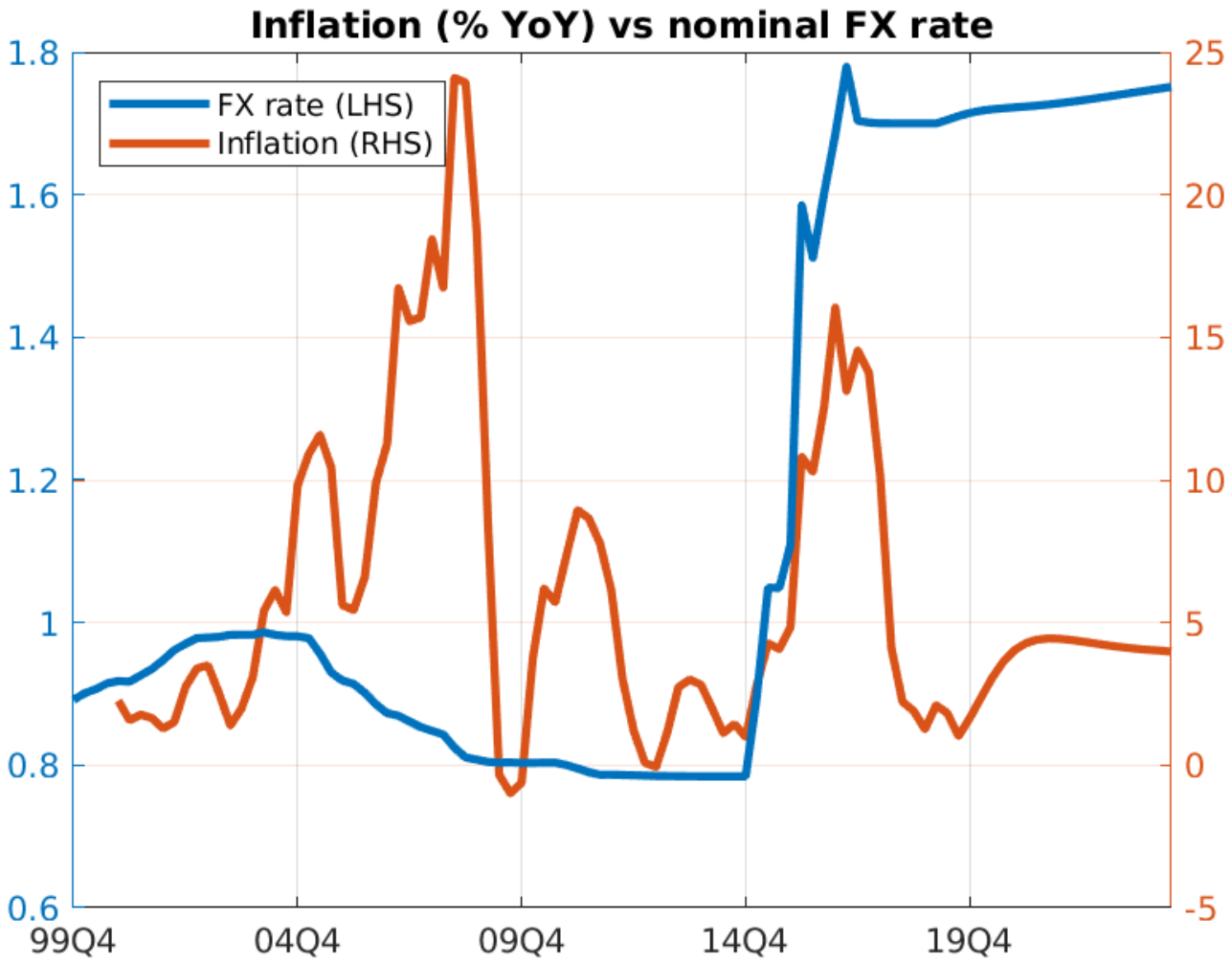
Oil-fuelled real appreciation

- What's the mechanism? What happened in 2009?
- Can you see 4-5 distinct periods?



Inflation and FX rate

- How can we explain 2005-9 vs 2010-13 vs 2014-17?



Monetary policy

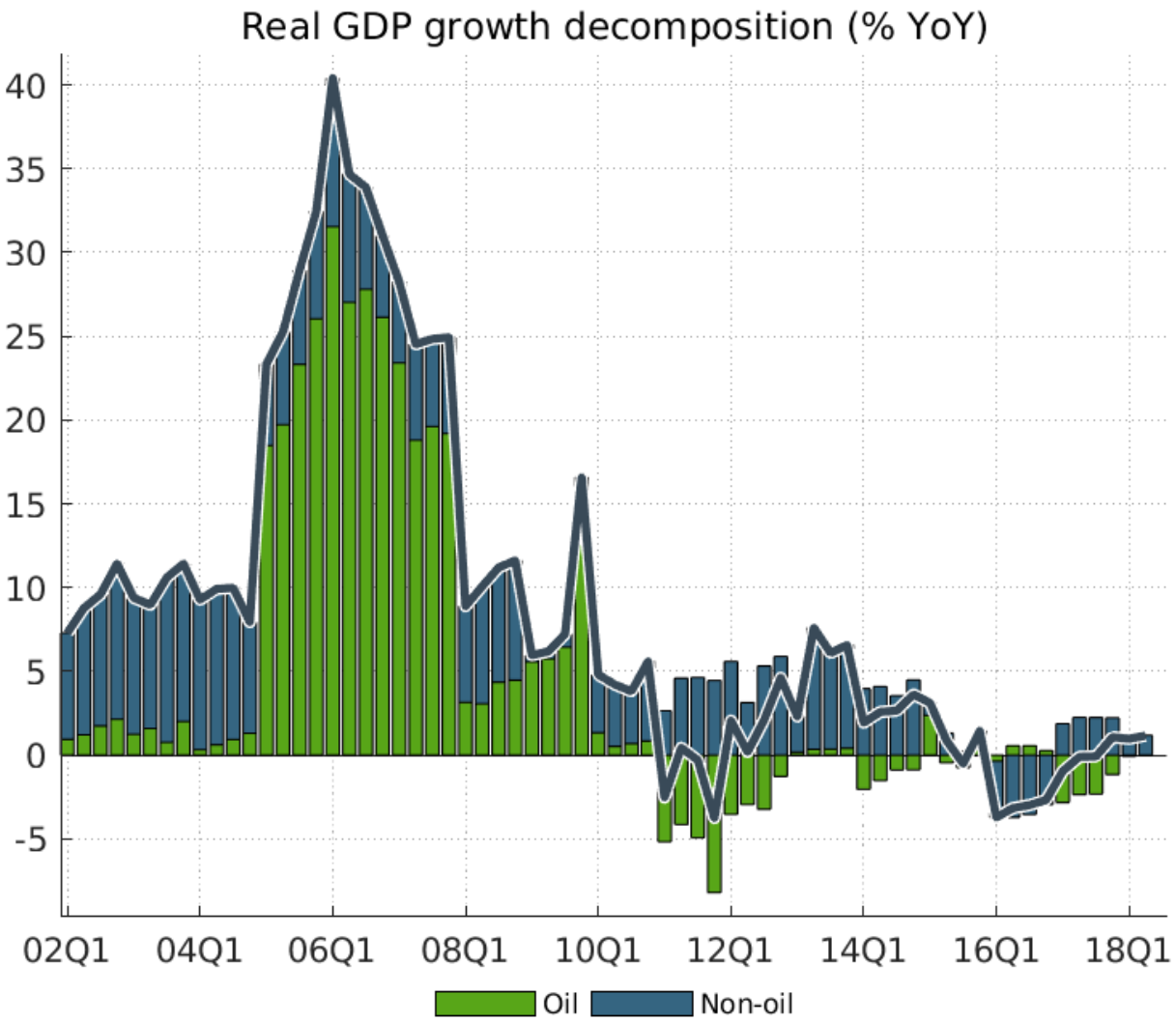
- Clear preference for FX rate stability over inflation stability
- But also sometimes adjustments – clearly not a strict fixed FX rate, so we cannot use the simple equation:

$$s_t = s_{t-1} + \varepsilon_t^s$$

- We need a rule that shows clear preference for FX smoothing
- The rule should also allow the FX to follow trends (REER movements)

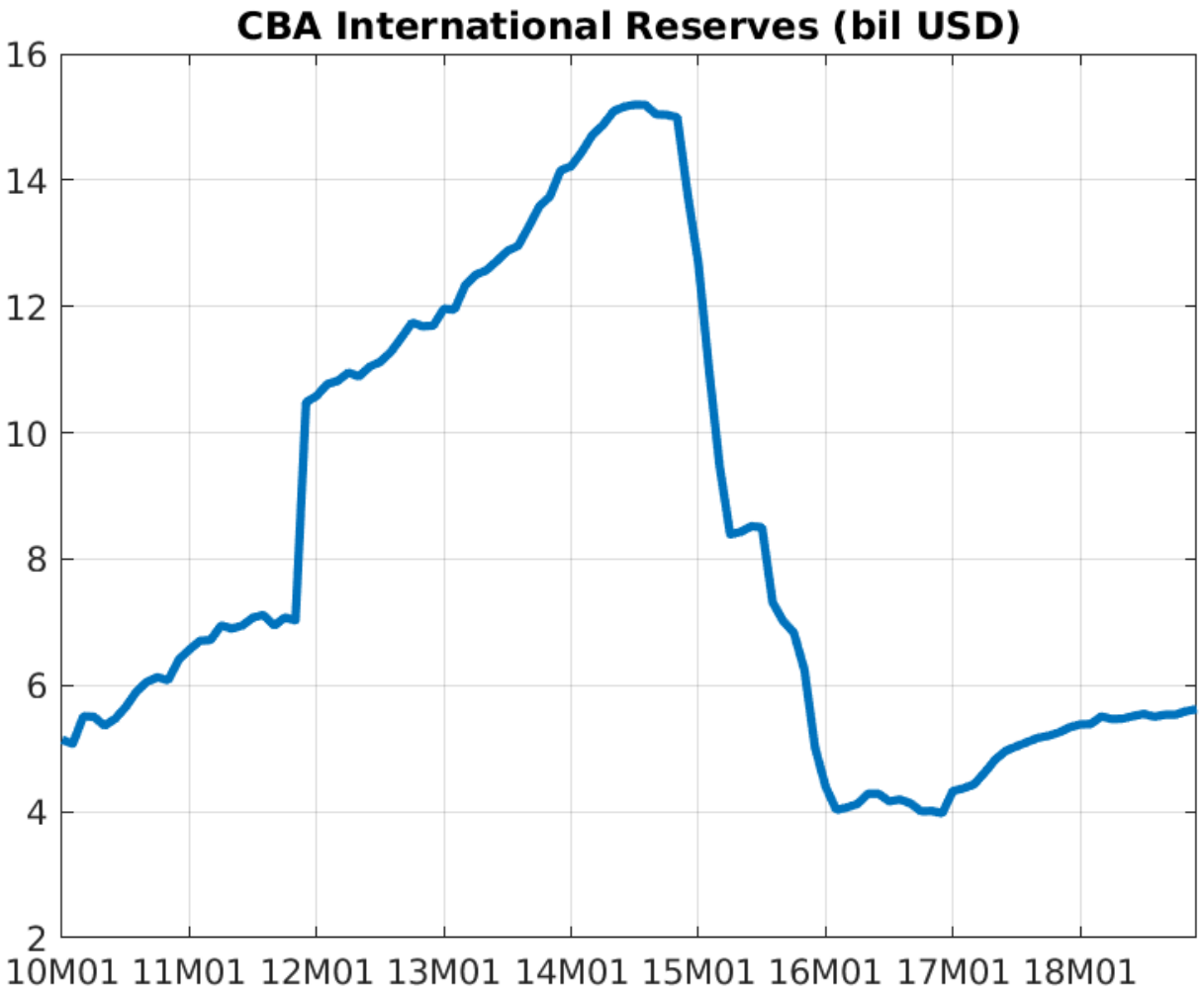
Fast GDP growth

- What's the mechanism? What drove growth in 2010-2014?



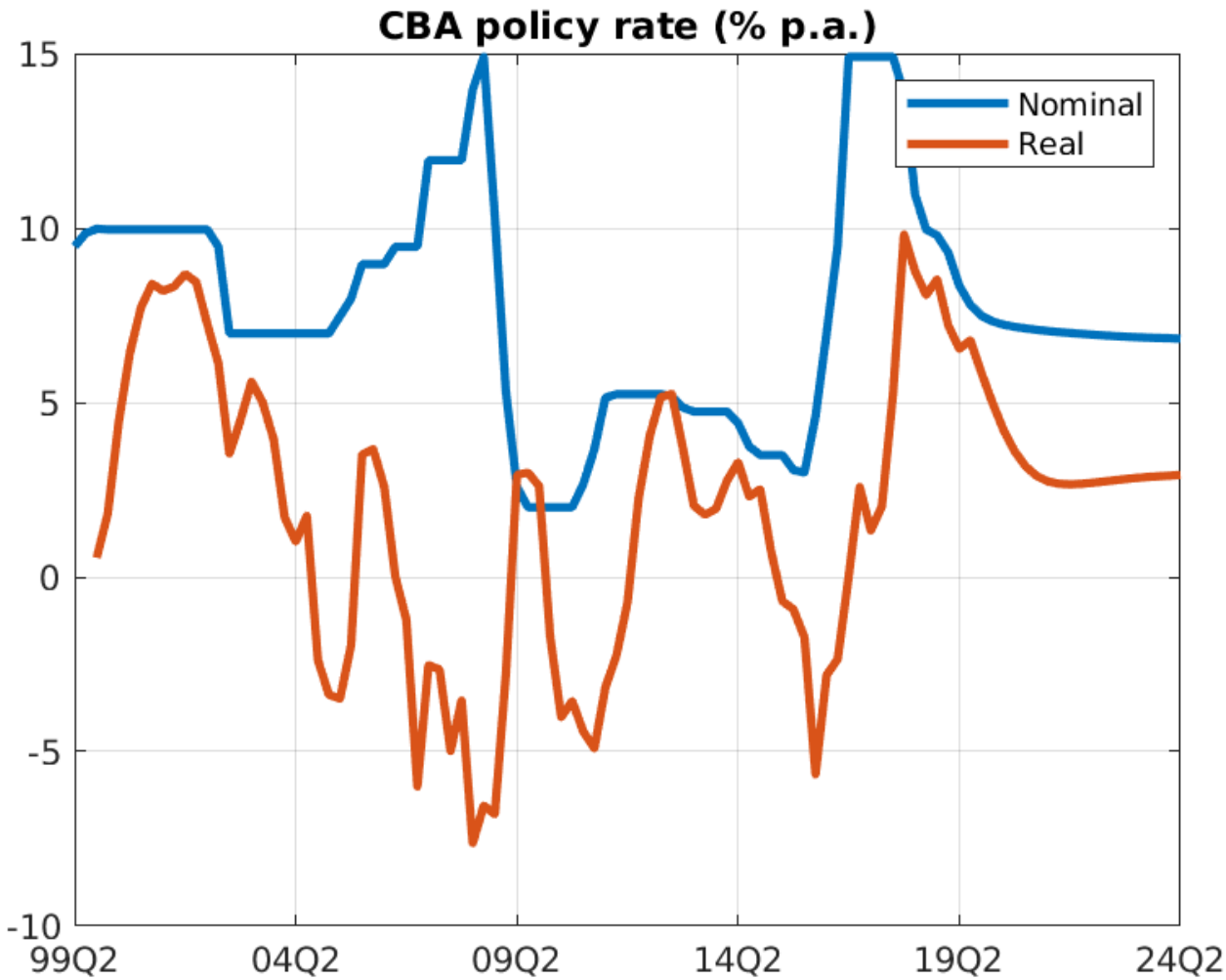
Dutch disease?

- What's the price level in Azerbaijan vs Georgia?



Low interest rates

- The CBA wasn't willing to pay the costs of sterilization



Implications for the model

- Oil effects:
  - REER: money inflow, real appreciation; monetary policy decided about the split between FX and inflation
  - GDP: fiscal effects (business cycle), but also investment (potential output)
  - FX Reserves
  - Which of these can we represent in the model without too much additional effort?
- Monetary policy:
  - Is it different from the standard QPM model?
  - Is it different before and after the crisis?
- Note: for other countries, we could consider remittances, foreign aid, money targeting, parallel exchange rate... Anything that is relevant.

Changes to trend equations

- IS curve:

$$\begin{aligned}\widehat{y}_t = &\beta_1 \widehat{y}_{t+1} + \beta_2 \widehat{y}_{t-1} \\ &- \beta_3 \widehat{r}_t + \beta_4 \widehat{z}_t \\ &+ \beta_5 \widehat{oil}_t \\ &+ \varepsilon_t^{\widehat{y}}\end{aligned}$$

- REER tnd:

$$\Delta \overline{z}_t = \rho^z \Delta \overline{z}_{t-1} + (1 - \rho^z) \cdot \overline{z}_{ss} + -(\Delta \overline{oil}_t - \Delta \overline{oil}_{ss}) + \varepsilon_t^{\overline{z}}$$

- Output potential:

$$\Delta \overline{y}_t = \rho^y \Delta \overline{\bullet} ney_{t-1} + (1 - \rho^y) \cdot \overline{y}_{ss} + +(\Delta \overline{oil}_t - \Delta \overline{oil}_{ss}) + \varepsilon_t^{\overline{y}}$$

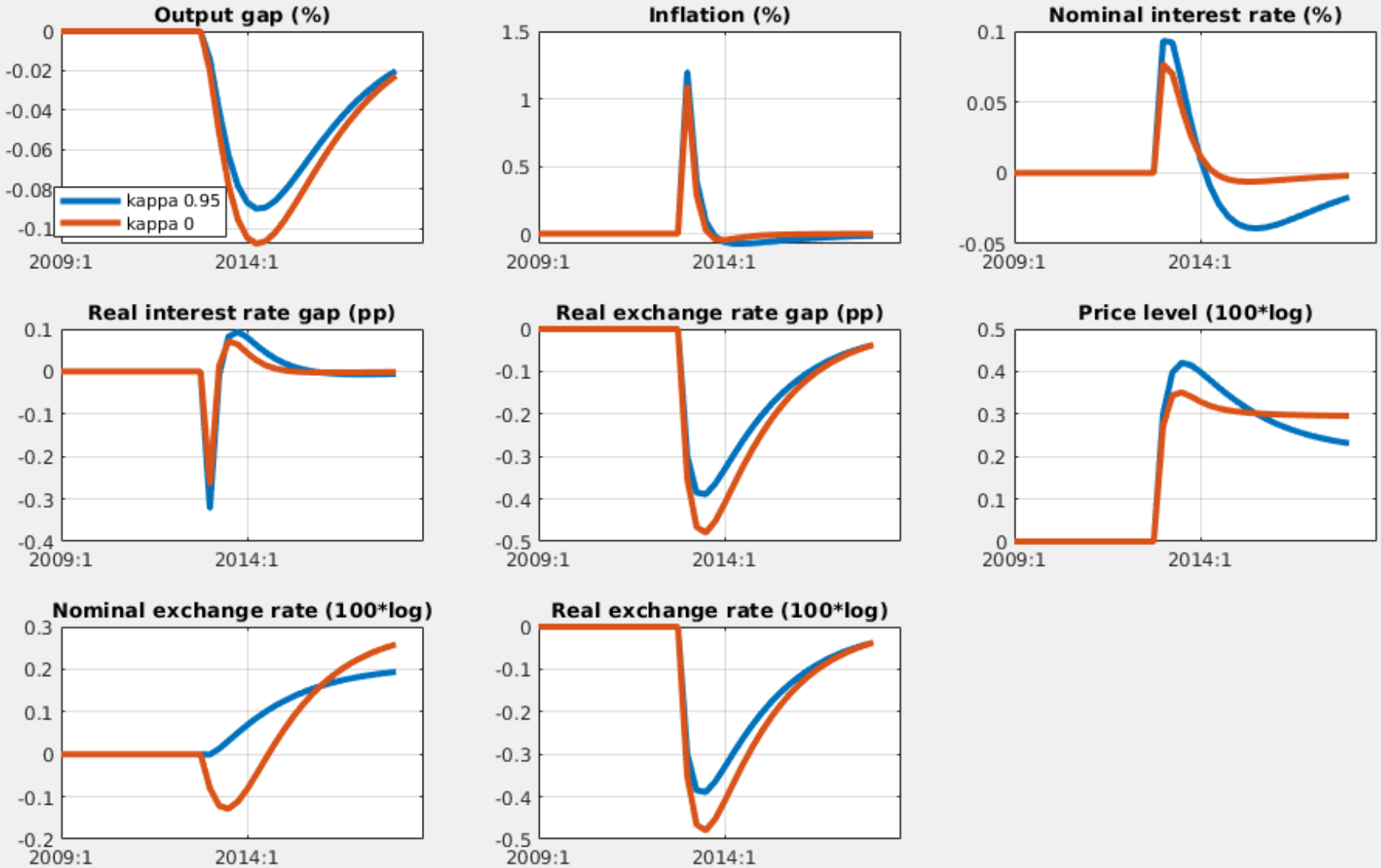
Exchange rate modeling

- Exchange rate rule - we replace "natural" UIP with a policy rule:

$$
\begin{aligned}
s_t &= \kappa_1 * \left((s_{t-1} + \Delta s_t^{tar} - \kappa_2 \widehat{z}_t \right) \\
&\quad + (1-\kappa_1) \left(E_t[s_{t+1}] + (i_t^* + prem_t - i_t)/4 - \kappa_3 \widehat{oil}_t \right) \\
\Delta s_t^{tar} &= \Delta \overline{z}_t + \pi_t^{tar} - \overline{\pi^*}_t
\end{aligned}
$$

- Parameter $\kappa_1 = 0.85$ controls how much the FX is flexible vs controlled
- We weaken the FX rate response to shocks
- Also, the external sector is not just "*", we have US, RU, Eurozone

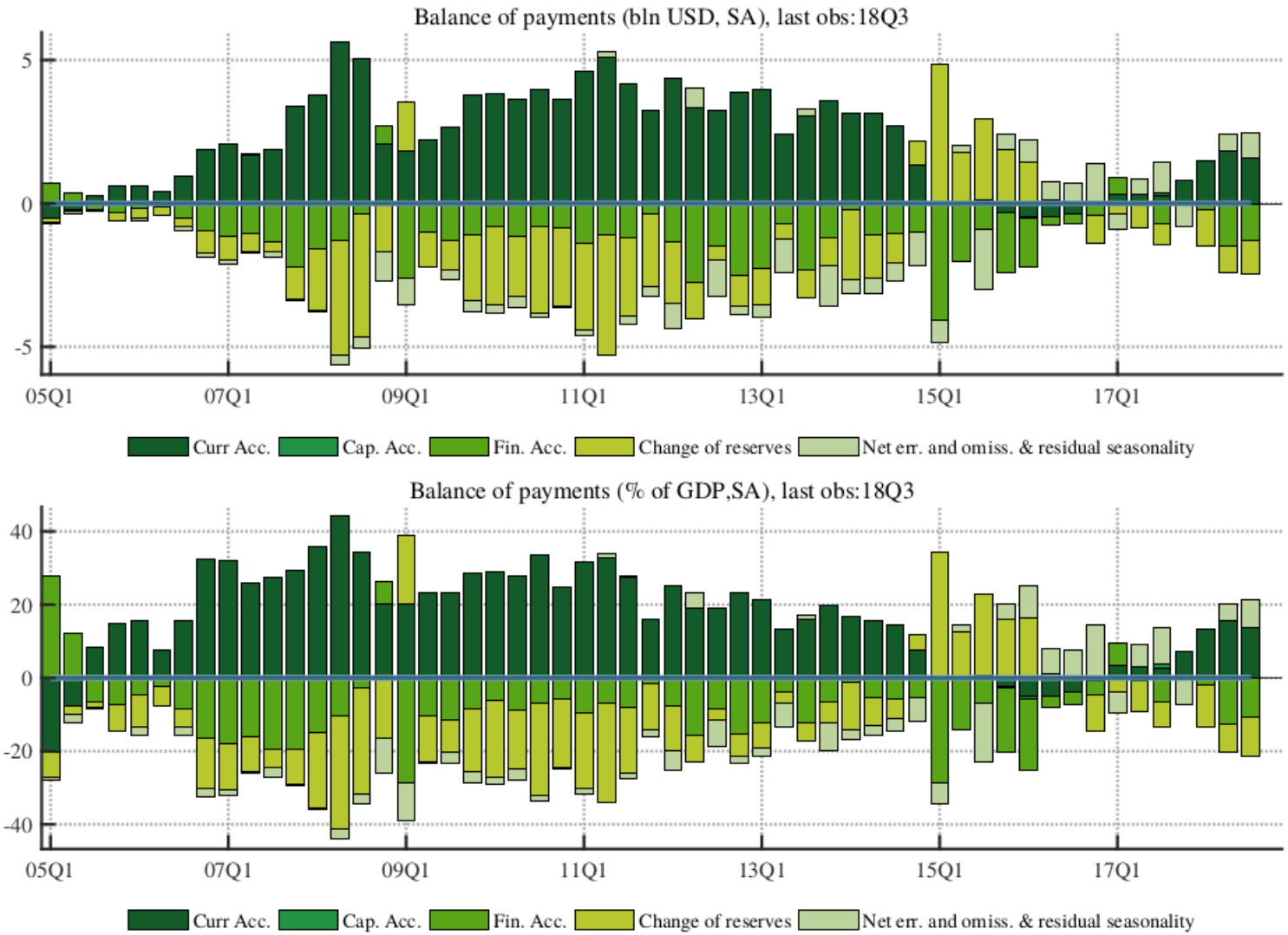
Effect of changing kappa



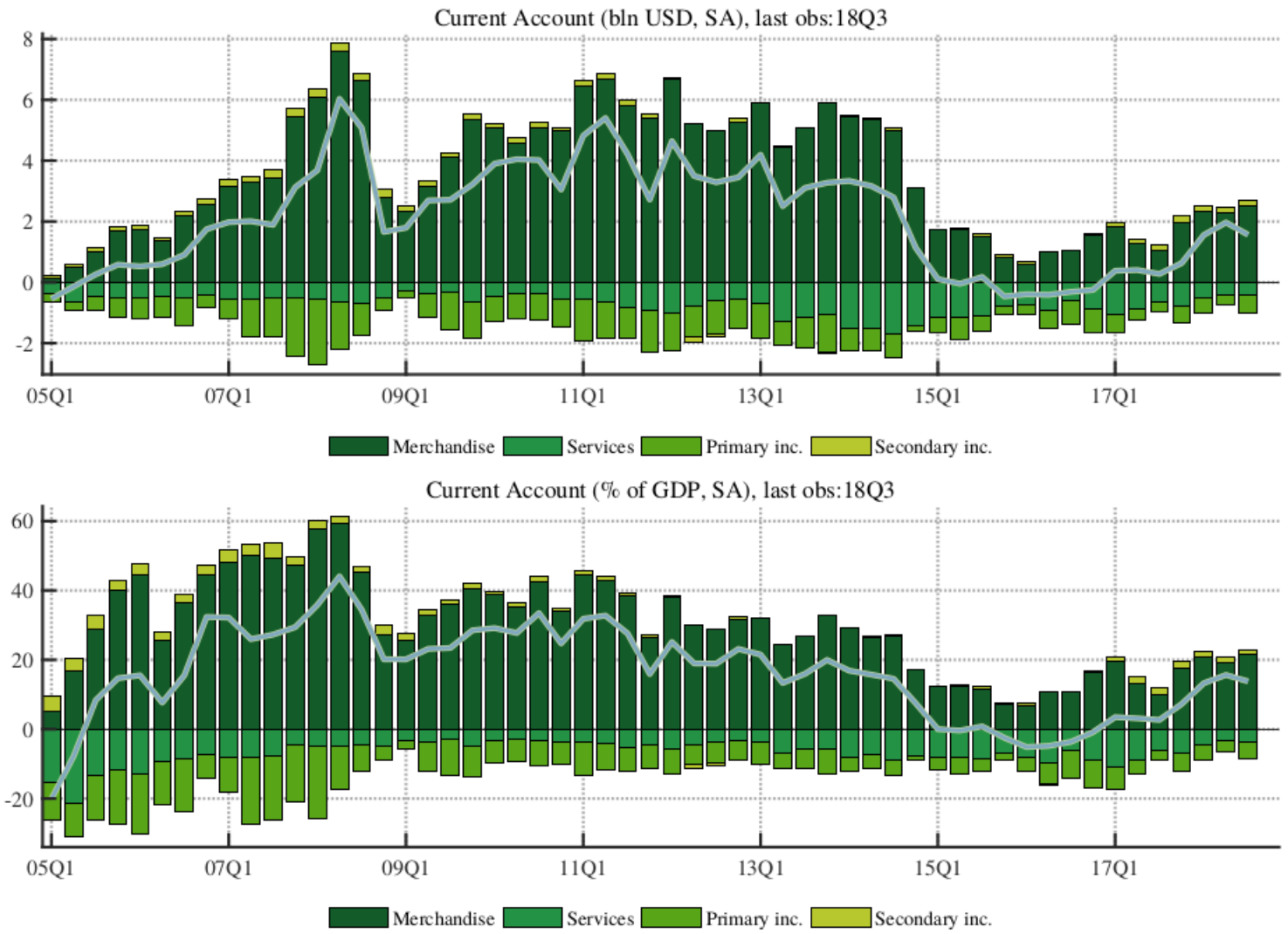
Mechanism of the crisis

- Oil price and income drops
- There are income effects - declining demand, ...
- But people still want to buy lots of imports – consumption smoothing
- Imbalance in the BoP - current account surplus reduces, financial inflows dispappear, pressure on forex reserves
- How do you convince people to buy less imports?
- Also ”speculation”, people trying to protect their savings
- In this case, it’s not hard to calculate necessary REER adjustment

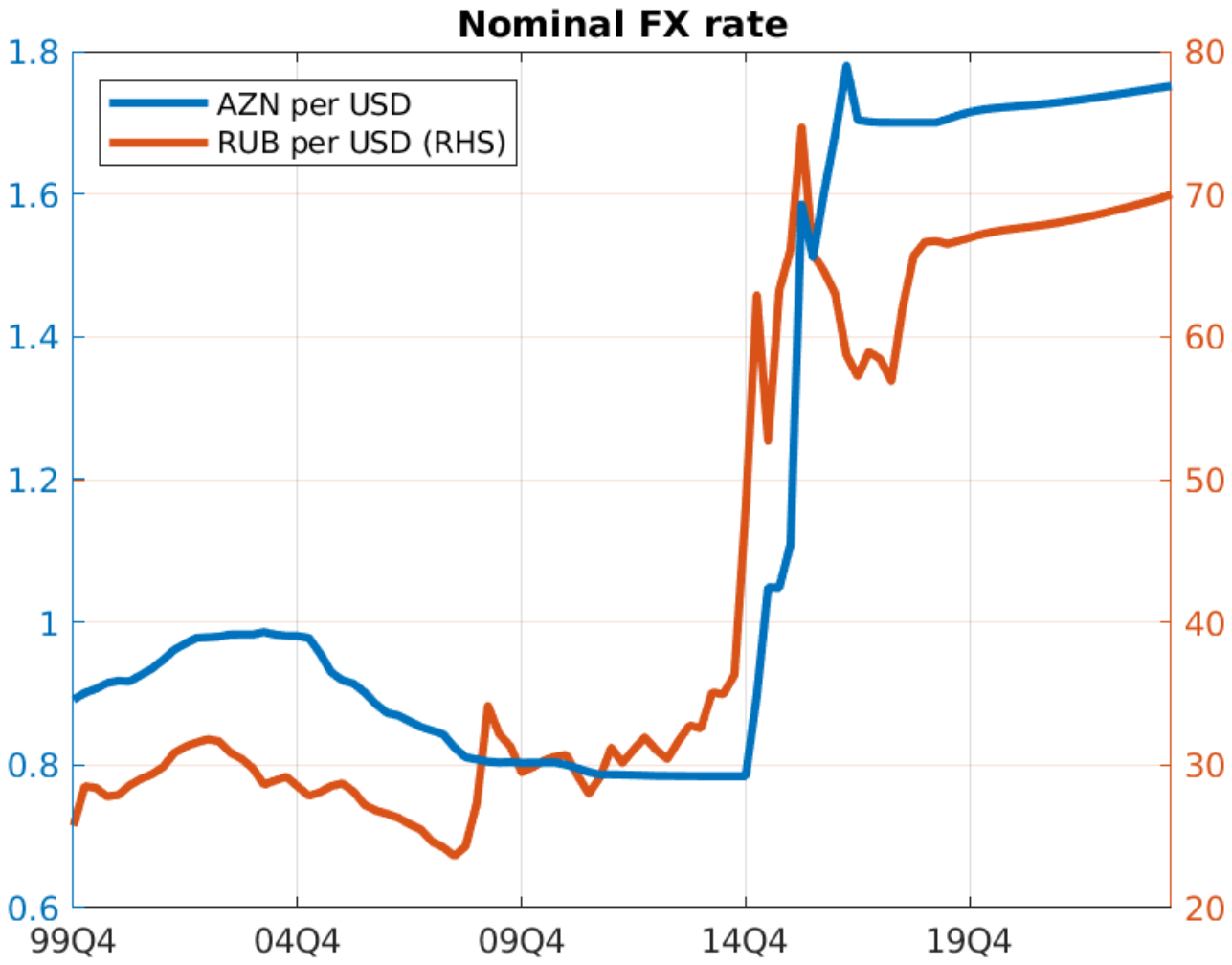
BoP


Balance of payments (bln USD, SA), last obs:18Q3
5
0
-5
05Q1
07Q1
09Q1
11Q1
13Q1
15Q1
17Q1
Curr Acc.
Cap. Acc.
Fin. Acc.
Change of reserves
Net err. and omiss. & residual seasonality
Balance of payments (% of GDP,SA), last obs:18Q3
40
20
0
-20
-40
05Q1
07Q1
09Q1
11Q1
13Q1
15Q1
17Q1
Curr Acc.
Cap. Acc.
Fin. Acc.
Change of reserves
Net err. and omiss. & residual seasonality

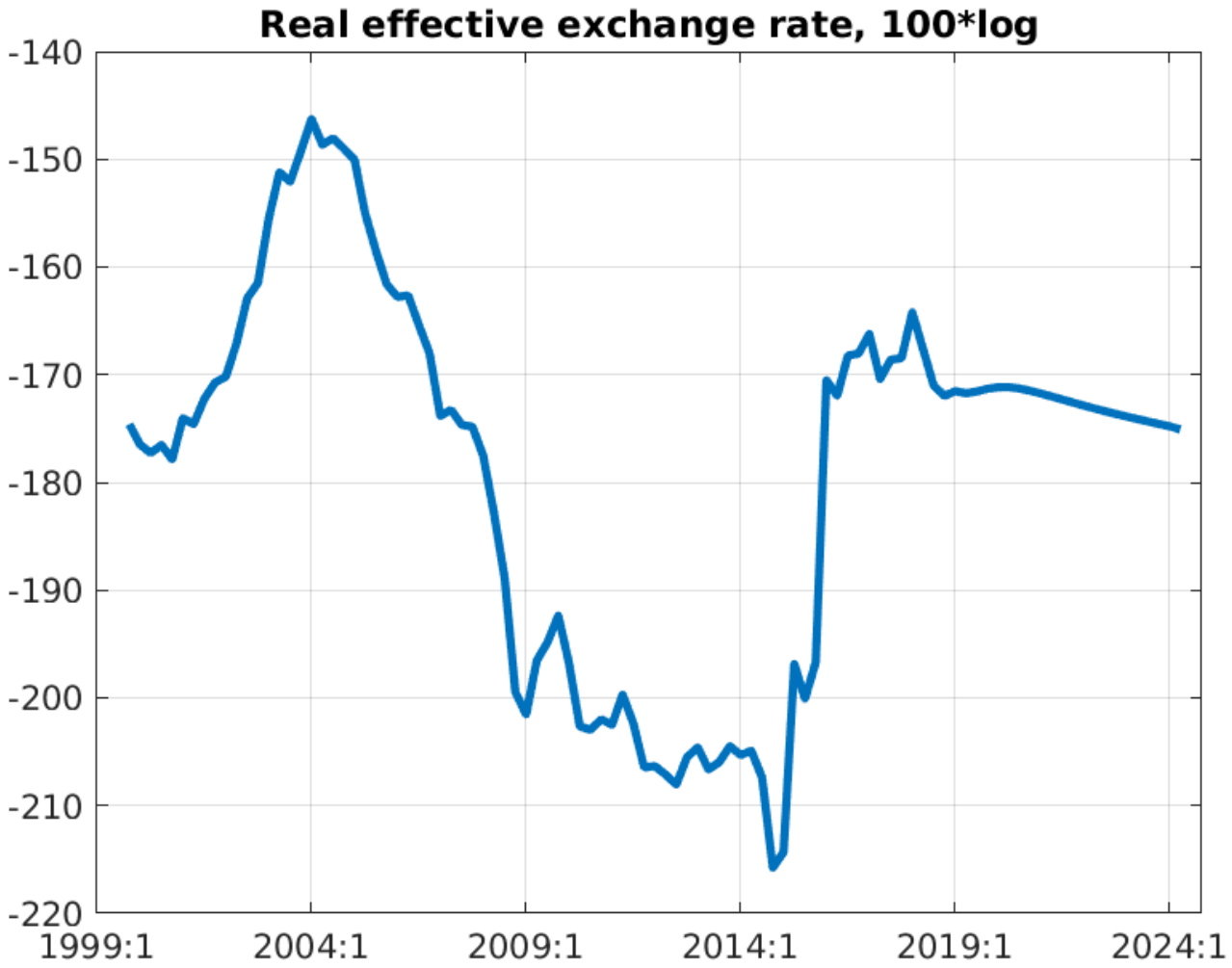
Current account



Another source of pressure on FX rate



REER - overshooting



Monetary policy considerations

- Faced with falling FX reserves, CBA had to act decisively
- Devaluation also beneficial for fiscal - expenditures in LCY, revenues in USDs
- But the cost is high inflation – why do inexperienced economists tend to overestimate the inflation after this kind of shock?
- The first step is clear, but the question is what next? What regime do you want to implement? Obviously the CBA wasn't sure either.

Outlook forward

- Based on your understanding of the economy, what will happen with:
  - GDP?
  - Inflation
  - FX rate
  - REER
  - Interest rates
- Consider short-term (1-3 years) and long-term (5 years)
- Bonus: why is inflation low now?

What exercise we'll do with the model

- We'll take data until 2014Q4, start forecast in 2015Q1
- We'll condition on all external variables - oil price, food price, RUB per USD, … (kinda cheating)
- We'll take impose shocks (soft tunes) that will help us replicate the actual observed variables
- Important: we need to understand econoimcally why we're imposing the shocks
- This is the basis of forecasting in practice

Which shocks come to mind to represent this episode?

- Ideally, we would only impose oil price path and everything will be done by the model
- Problem: large shock, world isn't linear, model is misspecified, we'll probably have to add some shocks
- Let's have a look at the infrastructure
- Next time, we'll just play with the forecast and look at some forecast texts

@CMOP Infrastructure

- Start IRIS
- initialize CMOP:
  c = cmop('./az_model','az201903','az_');
- c.readmodel();
- c.observeddata();
- c.analyzemodel();
- c.filterhistory('scenario')
- c.forecast('scenario') or c.forecast('base','alternative')
- Scenarios have to be defined in "az_round_options"

@CMOP Infrastructure cont.

- Scenarios have to be defined in ”az_round_options”
- Each scenario has a CSV file with tunes
- The tunes CSV is the primary place where you should work