Output Gap and Inflation with Persistent Demand Shocks

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A discussion on decoupling between real economic conditions and inflation started with the recovery from the financial and sovereign debt crisis at around 2014.

Standard inflation forecasting models over-predicted inflation (see Conti et al. (2014) and Landau (2014)).

The phenomenon that inflation stays low despite an ongoing recovery has been labelled the “missing inflation puzzle” (Constânzio, 2015).

With the output gap closing at 2017/18 and inflation staying low the puzzle has not gone away.

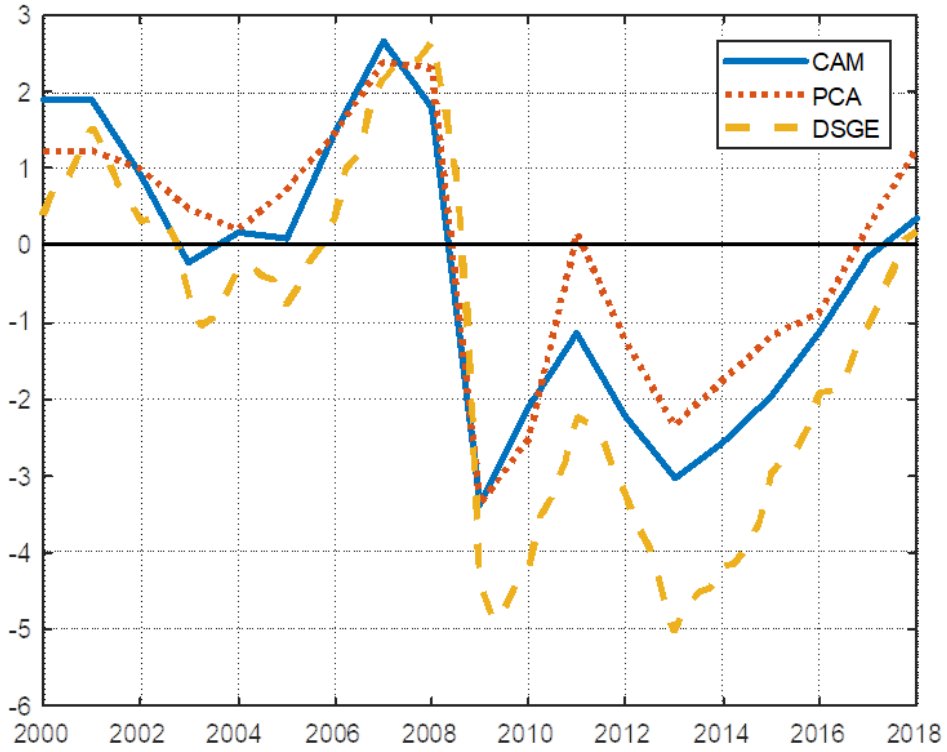
We will argue in this paper that in case of a large and persistent negative demand shock (e. g. induced by demographic trends, of a fundamental re-evaluation of financial market risks) which drives the economy towards the ZLB, the relationship between inflation and the output becomes weaker.

We will mostly focus on the period 2013-2019, since Covid is adding another important shock.

At the end of the presentation we will also briefly discuss the relationship between output gap and inflation in a lockdown.

Output gap estimates point towards a closing between 2017/ 18 (SVR 2019).

CAM output gap versus PCA and DSGE estimates for the EA (2000-2018)



CAM: Commission output gap (common agreed methodology)

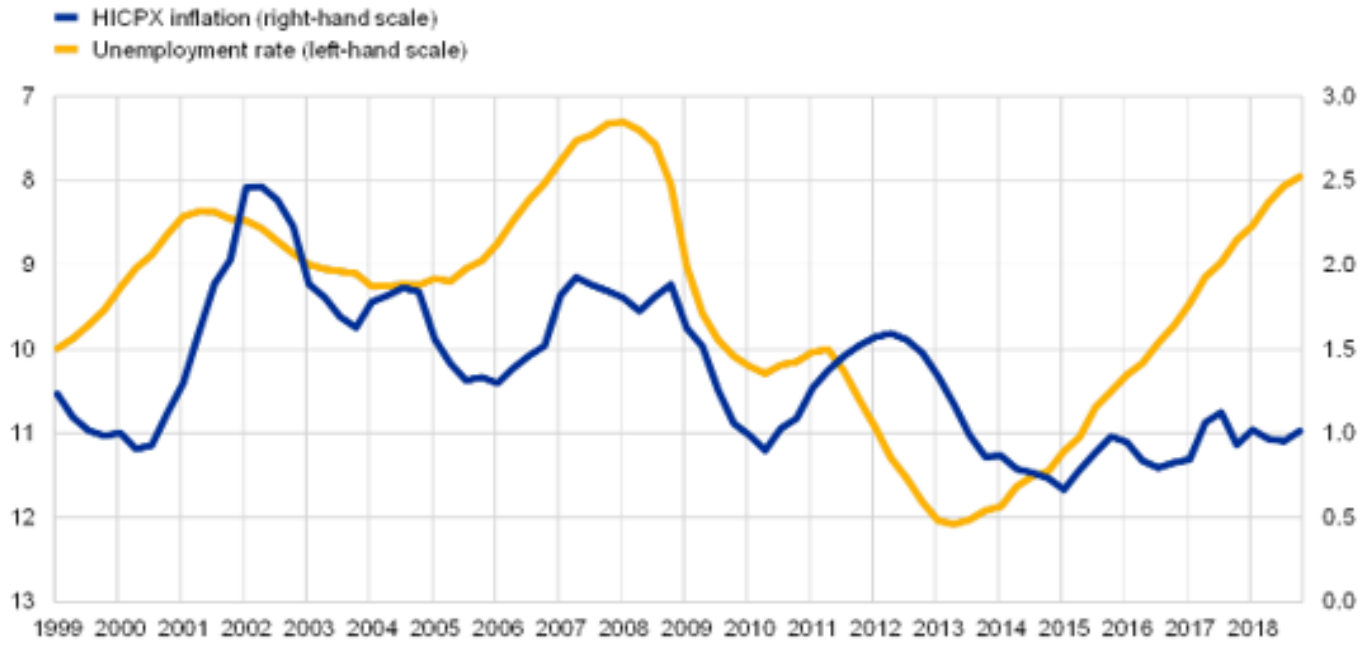
PCA: Principal components using business cycle indicators.

DSGE: Production function of GM Model.

But, core inflation remains low and fluctuates narrowly around 1%.

Core inflation (Euro Area)

Figure 1.3: Unemployment and HICP inflation (Euro Area)



Empirical work on inflation puzzle

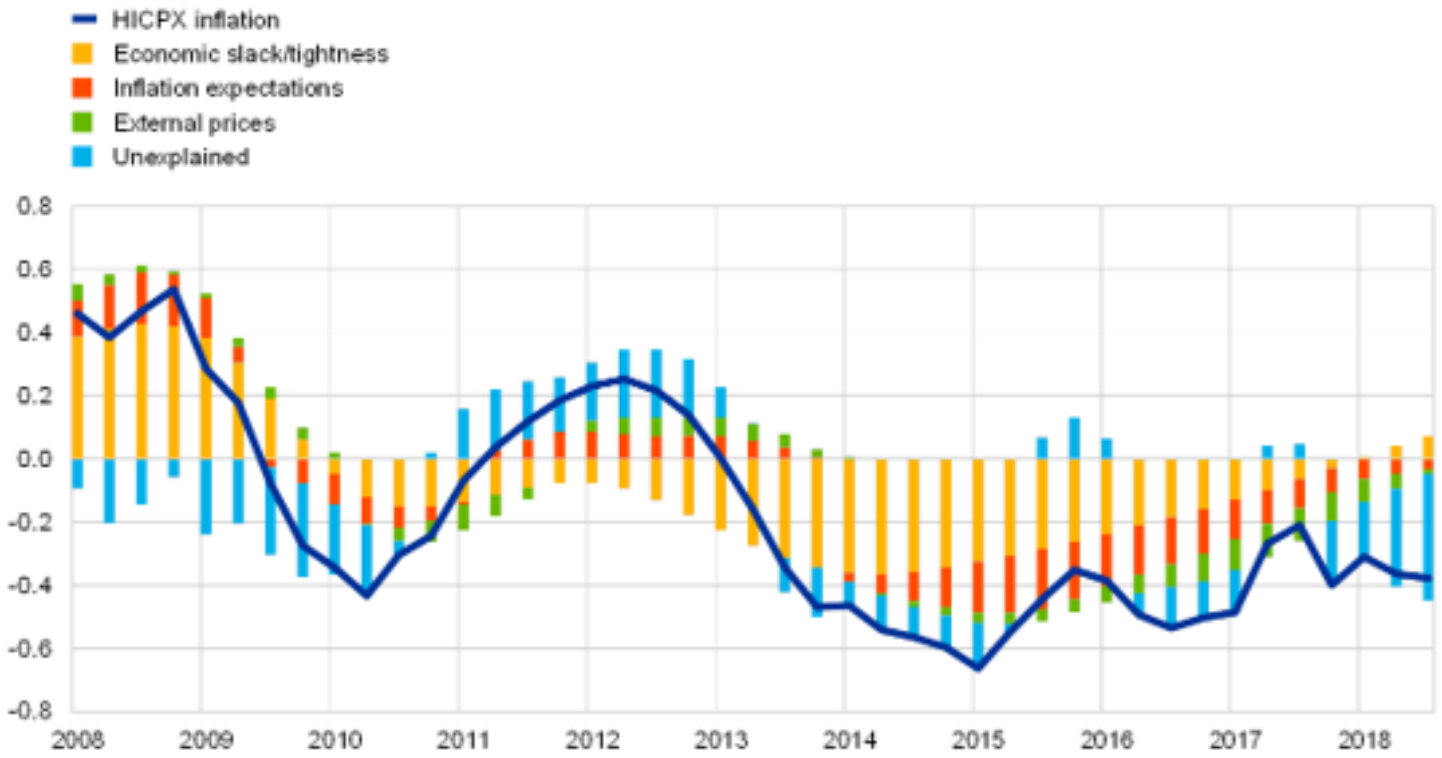
ECB has systematically explored various explanations based on Phillips curve regressions.

Bobeica and Sokol (2019): test alternative demand indicators, measures of inflation expectations and indicators of (foreign) supply shocks. => robust evidence in favour of an over-prediction of core inflation.

Moretti et al. (2019) extend the analysis to non-linear Phillips curves. No evidence for change in slope coefficients, no non-linear terms.

They find: Inflation expectations are important for predicting low inflation.

Figure 1.4: Phillips curve based decomposition of inflation (Euro Area)

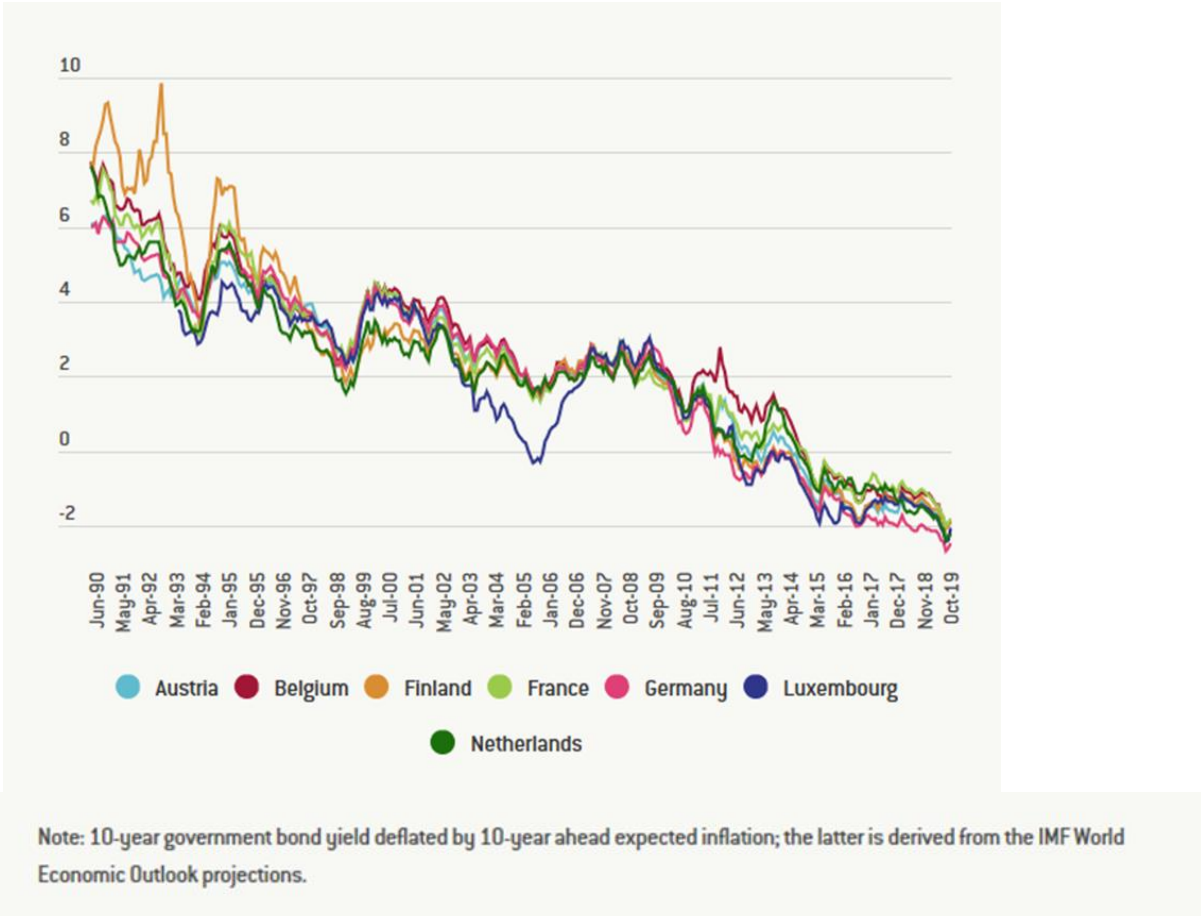


Secular stagnation debate:

A declining trend of the riskless interest rate plays an important role in the debate about secular stagnation (see Summers, 2016, Rachel and Smith, 2017).

Reasons: high savings due to anticipated demographic pressures and flight to safety behaviour (after 2009). => EA could have entered a ‘low for long’ interest rate environment with constrained nominal rates for a number of years if not decades similar to Japan, which is in such a situation already for about 20 years.

Figure 1.3: Real 10 year government bond yields



Source: Bruegel

Real riskless rates have become negative.

This paper:

Under which conditions can the new-Keynesian (NK) model generate decoupling between output gap and inflation?

Our focus: change in trend inflation, due to persistent demand shocks => long lasting liquidity trap.

The relationship between inflation and the output gap at the zero lower bound has been studied intensively (see Lubik and Schorfheide (2003), Farmer and Khramov (2015) and Cochrane (2017)).

Structure of presentation

Section 1 presents the simple NK model and analyses the link between inflation and the output gap under a Taylor rule.

Section 2 extends the analysis to the ZLB regime.

Section 3 shows the relationship between output gap and inflation under a Covid lockdown shock

2. New Keynesian model (Clarida et al. 1999)

$$y_{t,t+1} = \sigma\left(i_t - \pi_{t,t+1} + s_t\right) + y_t \quad (4)$$

$$\pi_t = s^f \beta \pi_{t,t+1} + \left(1 - s^f\right)\pi_{t-1} + \gamma y_t \quad (5)$$

$$i_t = Max(-(\rho + \bar{\pi}), \tau\pi_t) \quad (6)$$

Shock process: $s_t = \rho^s s_{t-1} + e_t > 0$ (7)

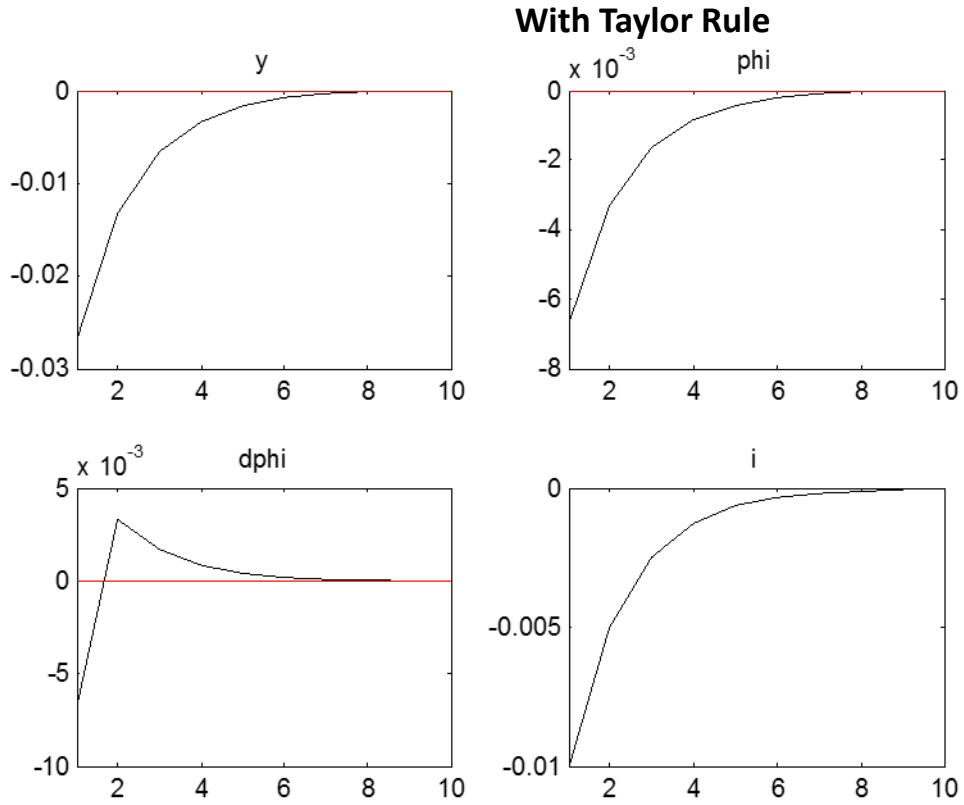
Parameters:

$$\rho = 0.01;\ \sigma = 1.;\ \gamma = 0.125;\ \tau = 1.5;\ s^f = (1, 0.5, 0.0);\ \rho^s = 0.975$$

Size of Shock: e_t = 0.02

All variables are expressed as deviation from their Taylor rule steady state.

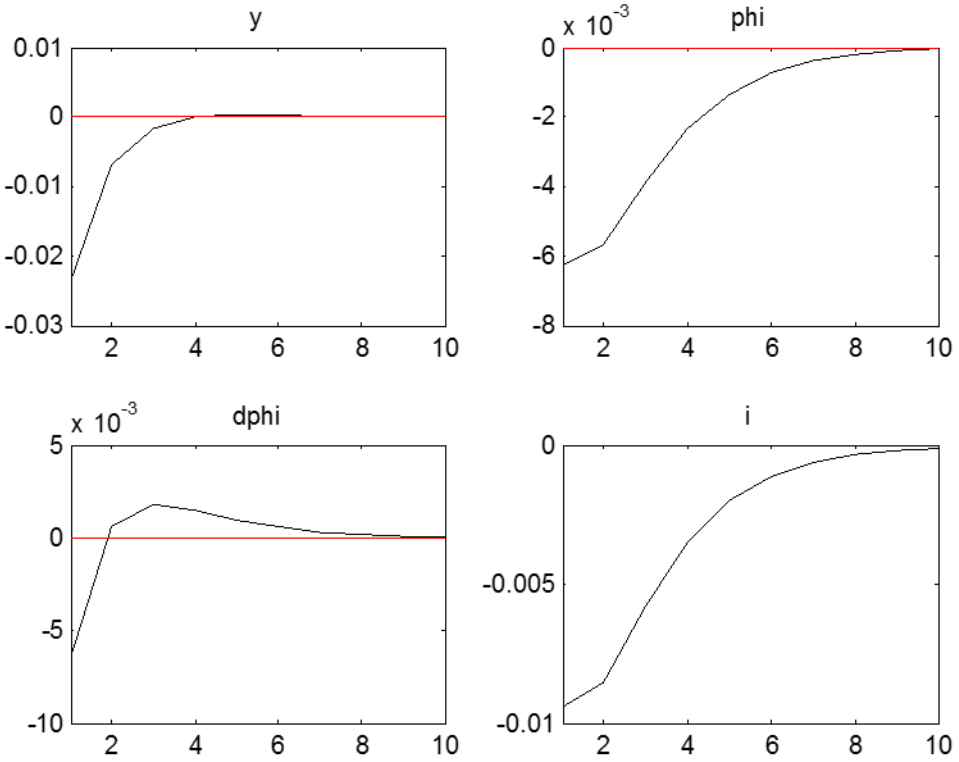
Figure 2.1: Temporary demand shock -FWD looking Phillips curve



Output gap and inflation are perfectly correlated

More decoupling with hybrid Phillips curve

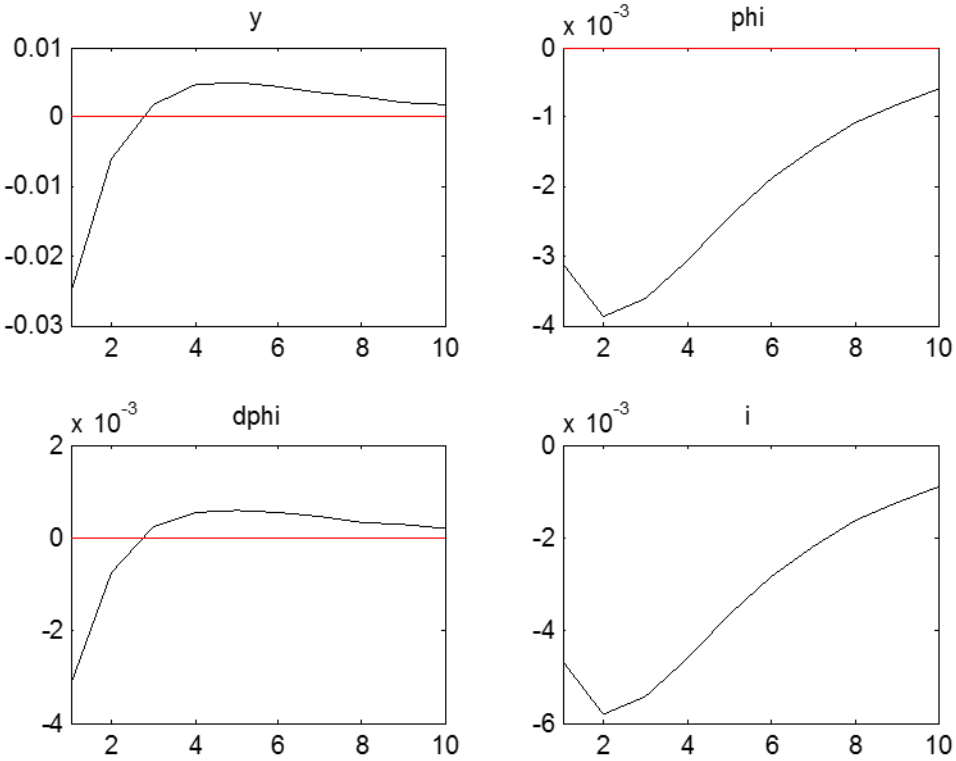
Figure 2.2: Hybrid Phillips curve (with Taylor Rule)



Co-movement between output gap and inflation becomes weaker
Inflation dap closes after output gap

Some co-movement between output gap and change of inflation

Figure 2.3: BWD Looking/accelerationist Phillips curve (with Taylor Rule)



The decoupling is even more extreme with a purely BWD looking Phillips curve.

Output gap becomes positive after inflation has reached a trough.

NOW: Co-movement between output gap and change of inflation

BUT: Inflation shows a strong upward trend after the initial trough, inconsistent with core inflation.

3. Solution with a ZLB constraint

Self-fulfilling expectations at the zero bound

With active monetary policy and well communicated inflation target, inflation expectations are anchored.

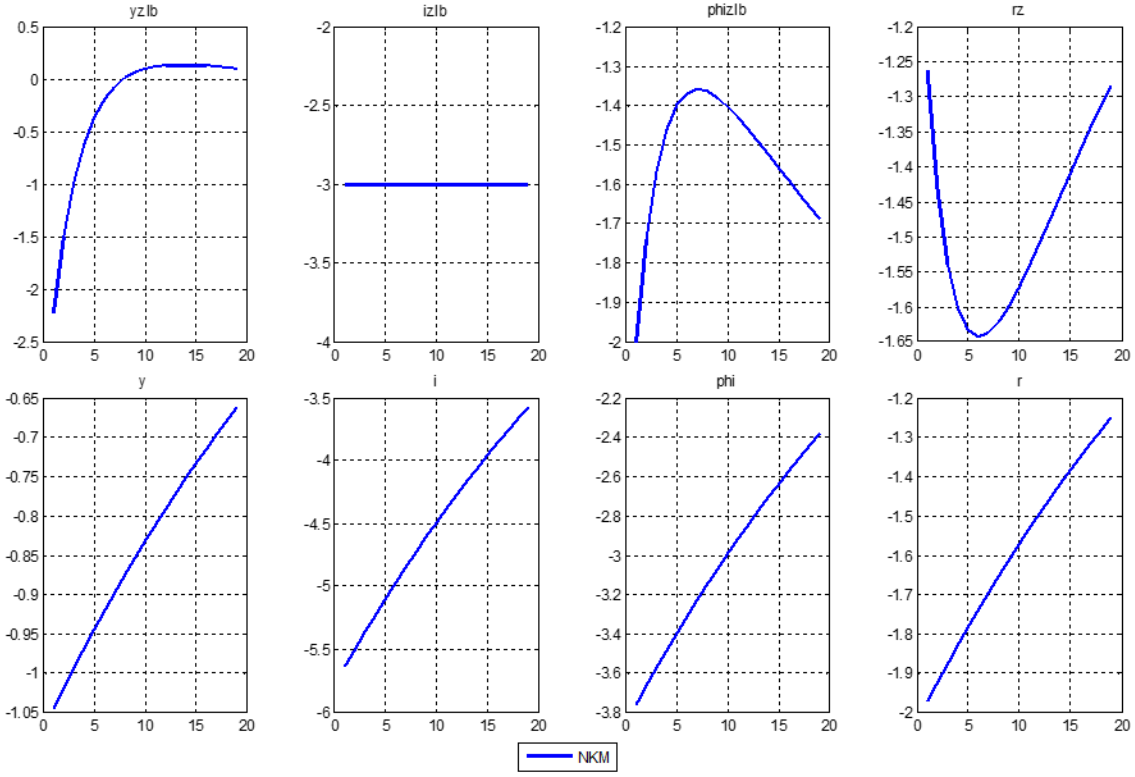
With monetary policy constrained by the zero bound over a longer period of time, inflation expectations become un-anchored.

Farmer and Khramov (2015) and Cochrane (2017) have studied adjustment under such circumstances.

They show that initial perceptions on how inflation adjusts to shocks determines the adjustment of output and inflation to the shock.

Persistent negative demand shock: Purely fwd looking Phillips curve

ZLB (top) vs. Taylor Rule (bottom) regime



With Taylor rule (bottom figures): long lasting output gap and inflation converging slowly towards the target.

De-coupling with ZLB constraint.

Short term stabilisation benefit when the CB is not restricted in reducing the policy rate. (y>yzlb)

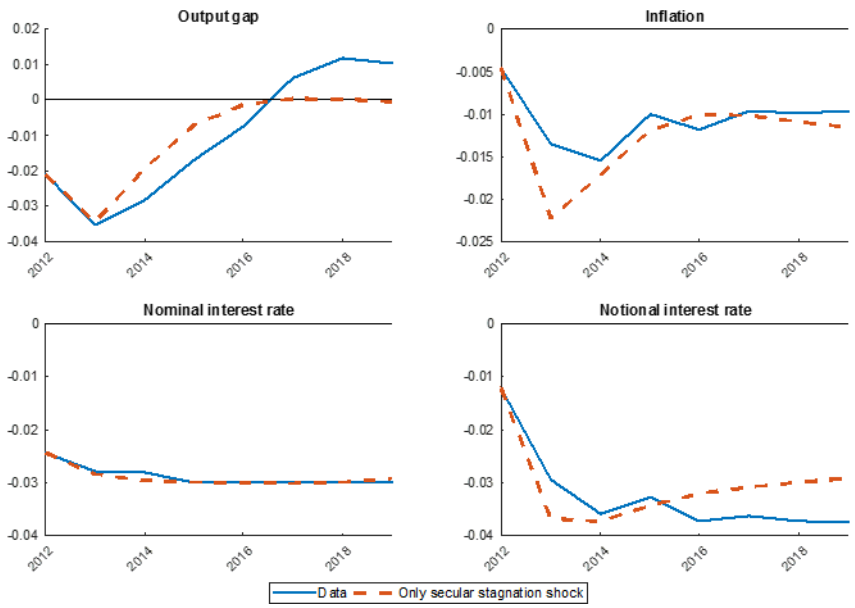
But inflation drops more with TR (phi <phizlb)

In ZLB regime:
Inflation not anchored at 2% but at lower rate
=>
distance between current inflation and target inflation is smaller in ZLB regime
=>
actual inflation= expected inflation reached earlier
=> gap closes faster.

De-coupling between yzlb and phizlb:
Ygap closes after 8 periods
Phizlb does not reach the inflation target

All values are deviations from steady state or target

Medium term prediction of secular stagnation shock



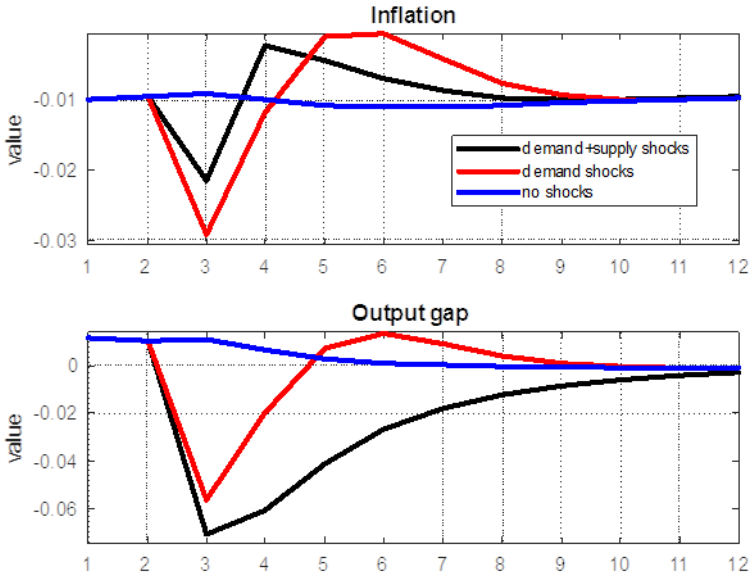
A single highly persistent demand/risk shock in 2013 can approximately match the output gap and inflation trend in an economy which is stuck at the ZB.

How does output gap and inflation respond to a lockdown shock at the zero bound?

Assumption: ECB will not change policy rates => ZB regime will persist

Our analysis is necessarily somewhat premature since we do not yet observe the year 21 fully.
We calibrate the shocks such that the model can generate inflation close to zero and an output gap at around -6%. in 2020.

Output gap and inflation during the lockdown



Lock down:
If temporary negative demand shock only => strong co-movement between output gap and inflation.

If temporary supply shock (interrupted value added chain) => helps to better match the emergence of inflation in 2021 and a growth slowdown (slower closing of the output gap).

Conclusion

The paper looks at the relationship between output gap and inflation in the presence of demand shocks, which is a likely scenario around 2008/09 and after 2012.

We show that under a long lasting liquidity trap a decoupling between output gap and inflation can arise.

With the Covid shock, the decoupling is more conventional and driven by a temporary supply shock.

Reserve Slides

Standard Equilibrium:

ω^{STD} = 1.9485e+06 => strong jump of output and inflation after agents learn about the persistent nature of the demand shock.

Figure 3.1a: Adjustment path under stand. equilribrium-global

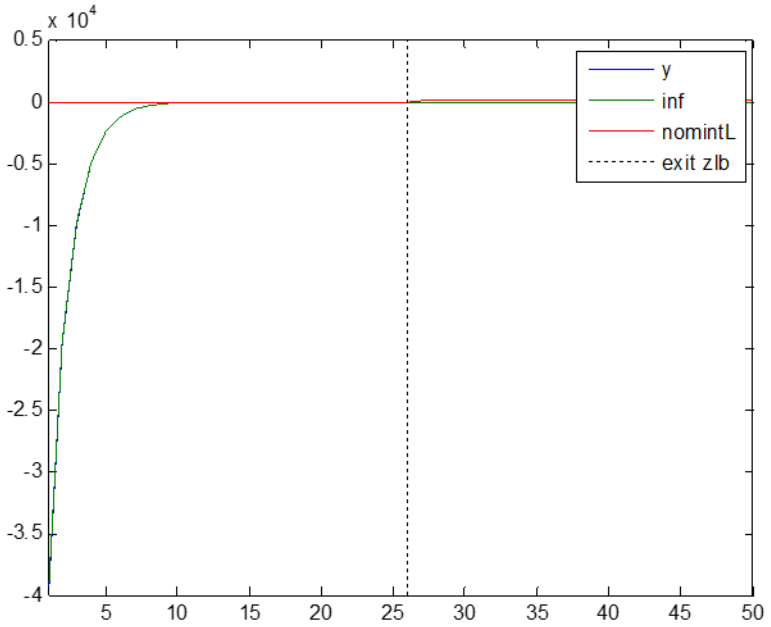
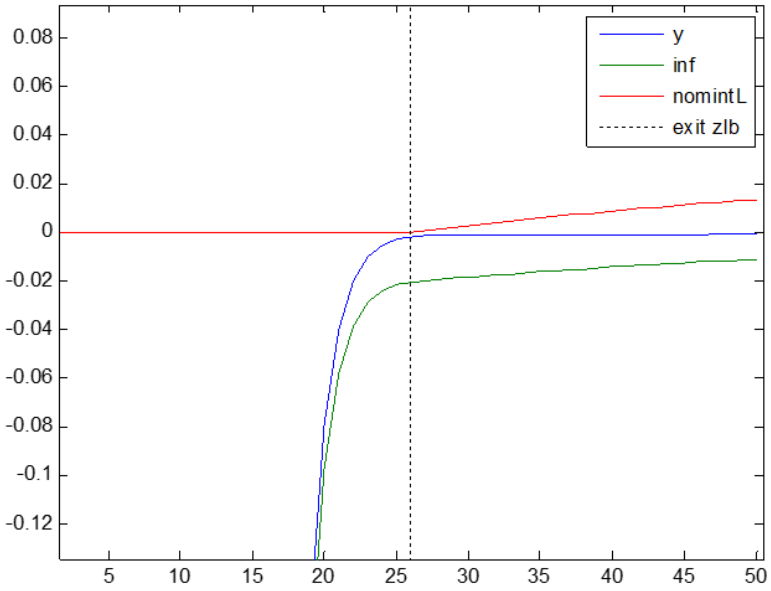
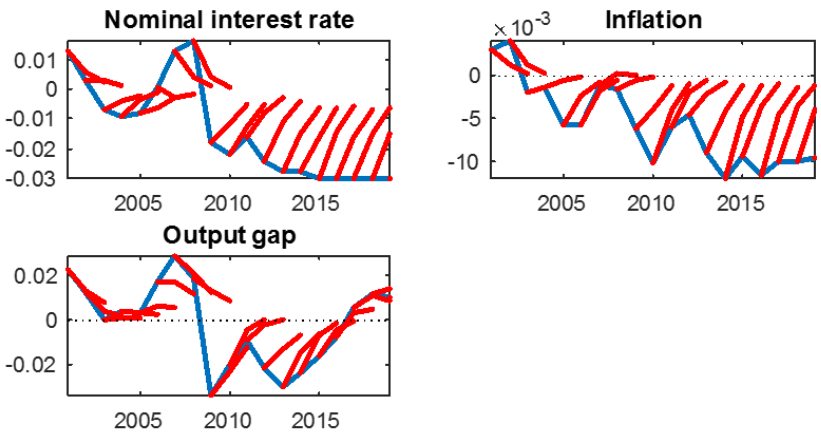


Figure 3.1b: Adjustment path under stand. equilibrium-local



2 year ahead forecasts: sequence of temporary demand shocks vs persistent shock

Sequence of temporary demand shocks



Persistent demand shock 2013