

1. Negative demand shock

- “We analyze the usefulness of different central bank balance sheet regimes under severe recessions in which interest-rate policy is constrained by the ELB, as has been the case across many advanced economies during and after the Great Recession. For this purpose, we consider a crisis scenario driven by an exogenous time preference shock. The shock drives the central bank’s deposit facility rate against its ELB, thus preventing further (conventional) monetary accommodation for some time.”
- “We now analyze the dynamic implications of different balance sheet policies when the economy is driven to the ELB. To bring the economy there, we simulate a temporary shock to the household discount factor β .”
- “At $t = 1$, the discount factor β increases unexpectedly, and then it gradually converges back to its steady state value following an AR(1) process; once the shock arrives, its future path is perfectly foreseen thereafter. We choose the size of the shock –common to all scenarios –such that the ELB constraint binds for 10 quarters under scenario (i).”
- We solve for the paths of the endogenous variables using the Newton-based perfect foresight solver for the non-linear model implemented in DYNARE. Notice that the future path of the exogenous variables (β and the unconventional policy response, if any) is revealed on the impact period. Computing the nonlinear solution has two advantages: It allows us to consider the ELB and to capture the highly nonlinear relationship between the central bank balance sheet size and the real variables.

2. Scenario 1: Corridor system without QE

- “A lean initial balance sheet with no unconventional policy response to the crisis: $b_t^{G,CB} = 0, \forall t$.”
- “We choose the size of the shock –common to all scenarios –such that the ELB constraint binds for 10 quarters under scenario (i).”
- “In all four cases the interest rate policy follows the same Taylor rule, and the economy is assumed to rest at the corresponding steady state before the shock.”
- “The blue lines in Fig. 5 display the economy’s response in scenario (i), i.e., under a lean balance sheet. As households become more patient, they postpone consumption, driving down aggregate demand and inflation. The central bank responds to the fall in inflation by lowering its two policy rates –holding the corridor width constant –, but the DFR hits the ELB, preventing further (conventional) monetary accommodation for some period.”

3. Scenario 2: Floor system

- “a large initial balance sheet but no unconventional policy response to the crisis: $b_t^{G,CB} = \bar{b}^{G,CB}, \forall t$.”
- “we consider an initial balance sheet size of 5% of GDP, a level high enough that $R_{SS}^{IB} \cong R_{SS}^{DF}$ and hence the economy effectively rests in a floor regime.”
- “The red lines show the responses in scenario (ii), where the central bank permanently operates a large balance sheet, i.e., a floor system. In this case the response of output and inflation is more muted, and welfare is higher relative to scenario (i).”
- “For our calibration, the additional stimulus afforded by the larger policy rate cut is actually enough to prevent the ELB from binding.”

4. Scenario 3: Corridor system with QE

- “Starting from the same lean balance sheet as in scenario (i), the central bank implements a temporary bond purchase program.”
- “We assume the central bank purchases bonds for 2 periods at a speed of 1% of steady state GDP per quarter, reinvests for one period, and then lets its bond portfolio mature; this path for bond holdings is announced contemporaneously to the crisis shock.”
- In terms of the rule in Eq. (24):

$$b_t^{G,CB} = (1 - \zeta)b_{t-1}^{G,CB} + \zeta\bar{b}^{G,CB} + NP_t + \zeta(b_{t-1}^{G,CB} - \bar{b}^{G,CB})ri_t$$

for central bank’s bond holdings, we thus assume $np_t = 0.01 Y^{annual}$ for $t = 1, 2$ and $ri_t = 1$ for $t = 1, 2, 3$.

- “The yellow lines in Fig. 5 display responses in scenario (iii), where the economy starts from the same lean balance sheet as in scenario (i), but the central bank engages in temporary asset purchases.”

5. Scenario 4: Corridor system with 1-year delayed QE

Quoted from the paper (Arce et al. (2020)):

- “Starting from the same lean balance sheet as in scenario (i), the central bank implements the same temporary bond purchase program as in scenario (iii), but with a 1-year delay.”
- “Scenario (iv) deviates from scenario (iii) in that the balance sheet expansion starts with an (anticipated) delay of 4 quarters relative to the crisis shock. While the central bank’s intervention is successful in lifting the economy from the ELB once it eventually comes into force, the economy stays at the ELB for the first 4 quarters.”

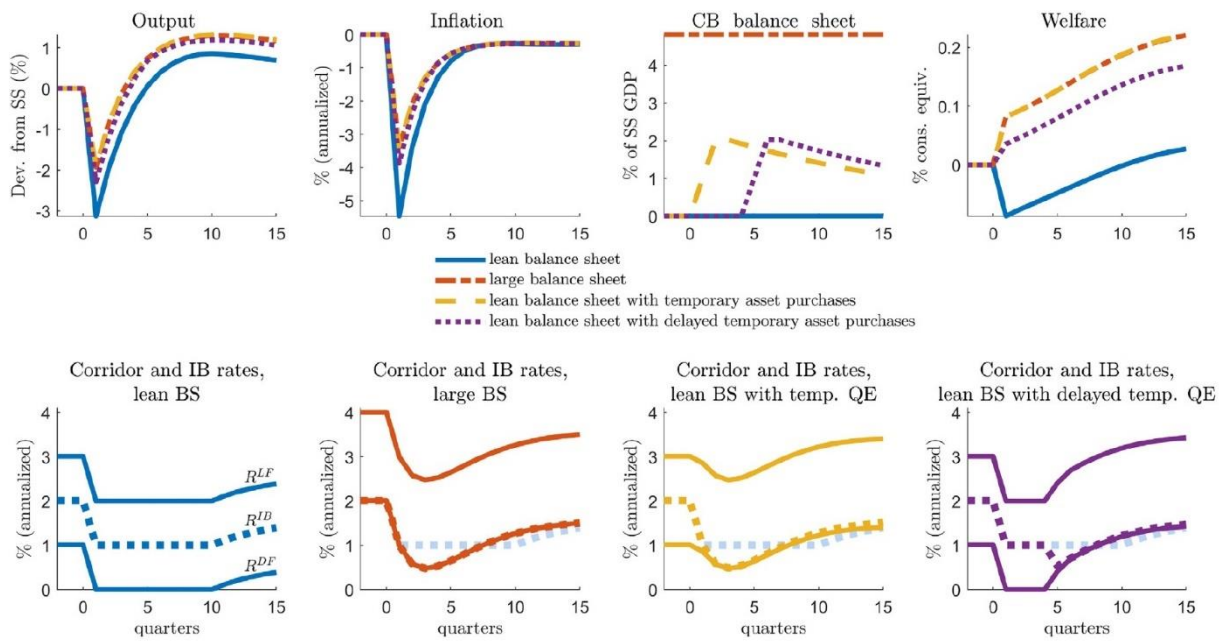


Fig. 5. This figure shows the responses of key variables to the shock under the different assumptions about unconventional monetary policy. The top row compares 3 variables across different scenarios. Each of the panels in the bottom row shows the corridor rates and the interbank rate in one of the 3 scenarios. The interbank rate under the first scenario is reproduced in all panels for comparison. The deposit rate is not plotted, however it is virtually identical to the interbank rate. Figure 6 in Appendix C shows further variables for the same simulations.