Unconventional Monetary Policies in Small Open Economies

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S V E R I G E S R I K S B A N K

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Research questions

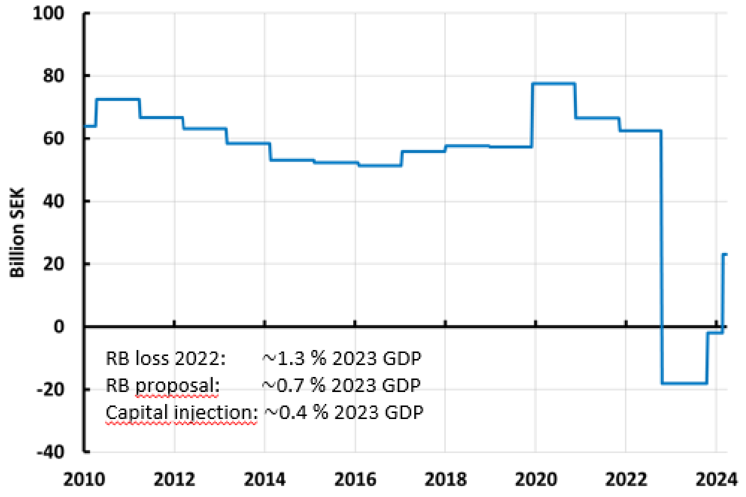
1. What are the macroeconomic *and consolidated fiscal* implications of unconventional monetary policies (LSAP/QE, NIRP) in small open economies?

2. How does the exchange rate channel affect the relative effectiveness of alternative tools?

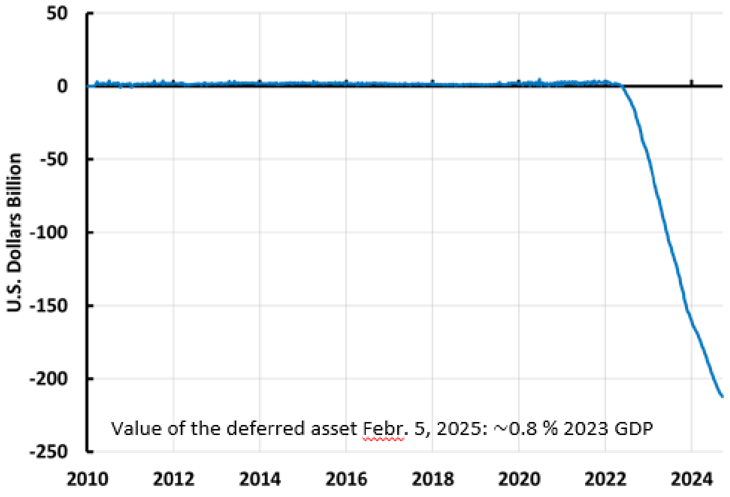
Motivation / Background

- Following the Global Financial Crisis, the Euro area debt crisis and the pandemic, central banks ventured into unprecedented territory, deploying unconventional monetary policy (UMP) tools.
- But LSAPs subsequently **resulted in substantial central bank losses**,

Sveriges Riksbank Equity



U.S. Federal Reserve Remittances



Note: The right panel illustrates that the Federal Reserve's costs began surpassing its income in September 2022, following the sharp increase in policy rates and the corresponding rise in interest expenses. Note that this data series represents a flow when positive but reflects a stock when negative. Specifically, when the Fed’s net income is positive, the series shows the weekly amount remitted to the U.S. Treasury. Conversely, when net income is negative, the series records the value of the deferred asset, representing the cumulative total of the Fed’s negative net income. As the Federal Reserve returns to profitability, it reduces its deferred assets until they are fully paid off, after which it resumes remittances to the Treasury.

Motivation / Background

- Following the Global Financial Crisis, the Euro area debt crisis and the pandemic, central banks ventured into unprecedented territory, deploying unconventional monetary policy (UMP) tools.
- But LSAPs subsequently **resulted in substantial central bank losses**, while their impact on inflation and output is increasingly questioned — as seen in newspaper headlines and policy reviews.

Where the Bank of England's QE programme went wrong

And what can still be done about it

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Economics
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BOJ's Bond Holding Paper Losses Hit Record After Rate Hikes

AUDIT REPORT | 13 DECEMBER 2023

The Riksbank's asset purchases – a costly experience

find any evidence that the Riksbank's extensive purchase of securities has had appreciable effects on inflation. The **Riksbank** underestimated the risks, and the purchases will lead to hefty losses.

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Economics
Central Banks

ECB Posts Record Loss Driven by Interest Bill for Past Policies

ECONOMY | CENTRAL BANKING

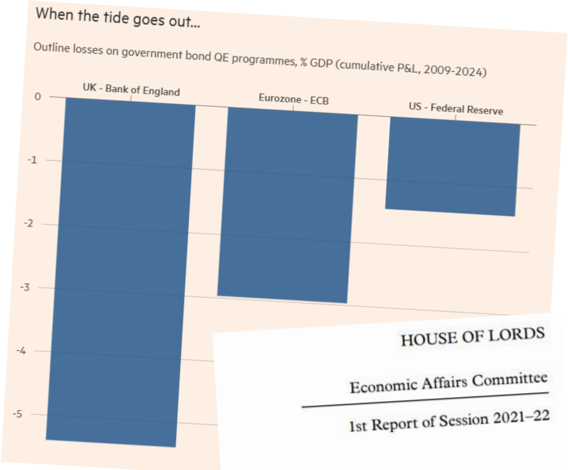
Federal Reserve Posted Loss of $77.6 Billion in 2024

Interest expenses outpaced interest income for the second straight year, though the losses were smaller than the previous year's

By Nick Timiraos
Updated March 21, 2025 1:27 pm ET

Was QE worth it?

Quantitative easing appears to have cost British taxpayers at least twice as much as equivalents in the US, Europe and other advanced economies



HOUSE OF LORDS

Economic Affairs Committee

1st Report of Session 2021–22

Quantitative easing: a dangerous addiction?

Motivation / Background

- Following the Global Financial Crisis, the Euro area debt crisis and the pandemic, central banks ventured into unprecedented territory, deploying unconventional monetary policy (UMP) tools.

- But LSAPs subsequently **resulted in substantial central bank losses**, while their impact on inflation and output is increasingly questioned — as seen in newspaper headlines and policy reviews.

- **However, no comprehensive assessment exists** — current studies offer valuable but only partial/ incomplete insights.

What we do

- Develop an open economy framework that can be used to weigh the macroeconomic benefits of UMP against the consolidated fiscal costs – i.e. from the onset of their use (Adrian et al. 2025).
    - The consolidated fiscal position includes the overall balance plus CB profits/losses

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  - The consolidated fiscal position includes the overall balance plus CB profits/losses
- Build New Keynesian DSGE model with:
  - Well known small open economy features
  - Bond market segmentation (Chen et al, 2013) => QE affects real activity
  - Behavioral discounting (Gabaix, 2020) and nonlinear Phillips Curve (HLT, 2023)
  - Conservative assessment of QE effects
  - Back up transmission of QE and NIRP with empirical VAR and LP evidence

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  - Conservative assessment of QE effects
  - Back up transmission of QE and NIRP with empirical VAR and LP evidence
- Explore effects of UMP (NIRP and QE) on macroeconomy, fiscal position, and CB profits
- Two parts:
  1. Study exchange rate channel in shaping effects of QE and fiscal policy in small open economies. (most of my talk today)
  2. Swedish case study on UMP effects on inflation, output, and consolidated fiscal position (2015–2019).
     - Compare UMP to a fiscal expansion: Counterfactual where Conventional Fiscal Stimulus Replaces Riksbank UMPs

Key findings

1. The exchange rate channel *amplifies* impact of UMP but *attenuates* the effectiveness of conventional fiscal policy to jointly boost output and inflation.
    - Implies QE can be effective (in a SOE) even if consumers are not directly affected by long-term yields.
    - Fiscal policy appears to have more limited scope than earlier findings might suggest.

2. Case study shows that Riksbank UMP led to higher output and inflation 2015-2019, with notable consolidated fiscal gains.
    - By end-2019, they strengthened public finances far more than subsequent post-pandemic Riksbank balance sheet losses.

Model overview

Model overview

- Build on closed economy model with standard NK features: sticky prices, sticky wages, and habit persistence in consumption
- Incorporate standard small open economy features.
- **Incorporate domestic and foreign bond market segmentation** to allow QE to have real effects (Andres et al., 2004; Chen et al., 2013):
  - “Financially Restricted” households: trade only in *domestic* long-term bonds, with geometrically decaying coupons (Woodford, 2001).
  - “Financially Unrestricted” households: trade in *domestic and foreign* long-term bonds subject to portfolio frictions. They also trade in *domestic* short-term bonds (but not in foreign short term bonds).
- **Behavioral discounting** (Gabaix, 2020) to address FG and FG FX puzzles and nonlinear **Phillips Curve** (Harding et al., 2023) to capture risks of overheating
- Fiscal block includes labor and consumption taxes.

How QE raises aggregate demand

- In our model, the macroeconomic impact of asset purchases through LSAPs hinges on their effect on the term structure of interest rates and the exchange rate.
- Examine a linearized arbitrage equation derived by solving the portfolio choice problem of households of type $j = \{u, r\}$

$$\mathbb{E}_t^j \hat{R}_{L,t+1}^1 = \hat{R}_t + \zeta_h \hat{B}_{h,L,t}^j,$$

$$\Downarrow$$

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Two channels:

1. The linearized foc for LT bonds for <u>restricted</u> agents:

$$\widehat{\Lambda}_t^r = \mathbb{E}_t^r \widehat{\Lambda}_{t+1}^r + \mathbb{E}_t^r \hat{R}_{L,t+1}^1 - \mathbb{E}_t^r \hat{\pi}_{t+1}.$$

where Λ_t^r denotes marginal utility of consumption.

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where Λ_t^r denotes marginal utility of consumption.

2. The portfolio decisions made by foreign agents is captured by the following linearized "long" Uncovered Interest Parity (long-UIP) condition:

$$\mathbb{E}_t^u \hat{R}_{L,t+1}^1 = \mathbb{E}_t^u \hat{R}_{L,t+1}^{1,*} + \mathbb{E}_t^u \Delta S_{t+1}.$$

- The long-UIP condition implies that, if LSAPs by a central bank decrease the expected return on domestic long-term bonds the domestic currency must be expected to appreciate in the next period (depreciate in the current period).
- The exchange rate channel of LSAPs described above operates irrespectively of the share of restricted agents in the economy.

Policy rules and calibration: Monetary Policy

- Short-term policy rate follow Taylor-type simple instrument rule subject to a perceived effective lower bound $\boldsymbol{\lambda_t}$

    - $R_t = max\{\boldsymbol{\lambda_t}, \tilde{R}_t\}, \qquad \frac{\tilde{R}_t}{\check{R}_t} = \left(\frac{\tilde{R}_{t-1}}{\check{R}_{t-1}}\right)^{\gamma_r} \left[\left(\frac{\pi_t}{\pi}\right)^{\gamma_\pi} \left(\frac{y_t}{y_{t-1}}\right)^{\gamma_y}\right]^{1-\gamma_r} e^{\boldsymbol{\varepsilon_t^r}}$

- CB can purchase domestic and foreign long bonds by issuing one-period reserves B_t^c (pay R_t).

    - The central bank's asset portfolio is $P_{L,t}B_{H,L,t}^c + S_t P_{L,t}^* B_{F,L,t}^c = -B_t^c$.
    - The combined negative short- and positive long-positions yield a net profit (loss) for the central bank.
    - We define domestic asset purchases as announced purchase plans:
        - $QE_t \equiv P_{L,t}B_{L,t}^c = \kappa \frac{P_{L,t}}{P_{L,t-1}} QE_{t-1} + \boldsymbol{\varepsilon_t^{QE}} + \boldsymbol{\varepsilon_{t+1}^{QE}} + \boldsymbol{\varepsilon_{t+2}^{QE}} + \cdots,$

Policy rules and calibration: Fiscal Policy

- Consolidated government flow budget constraint:

$$B_t^f + P_{L,t}B_{L,t}^f + \tau_t^c P_t c_t + \tau_t^n W_t n_t + T_t + \Phi_t^c = R_{t-1}B_{t-1}^f + \left(1 + \kappa P_{L,t}\right)B_{L,t-1}^f + P_{G,t}\boldsymbol{g_t}$$

- Proportional taxes on consumption and labor income
- Exogenously assumed maturity structure of fiscal debt (perpetuity)
- Central bank profits / losses (Φ_t^c) immediately transferred to Treasury
- Fiscal policy is "passive" – debt stabilized by *gradual* adjustment of τ_t^n
  - $\tau_t^n - \tau^n = \psi_\tau(\tau_{t-1}^n - \tau^n) + (1-\psi_\tau)\psi_b\left(GD_t \quad - GD \quad\right)$

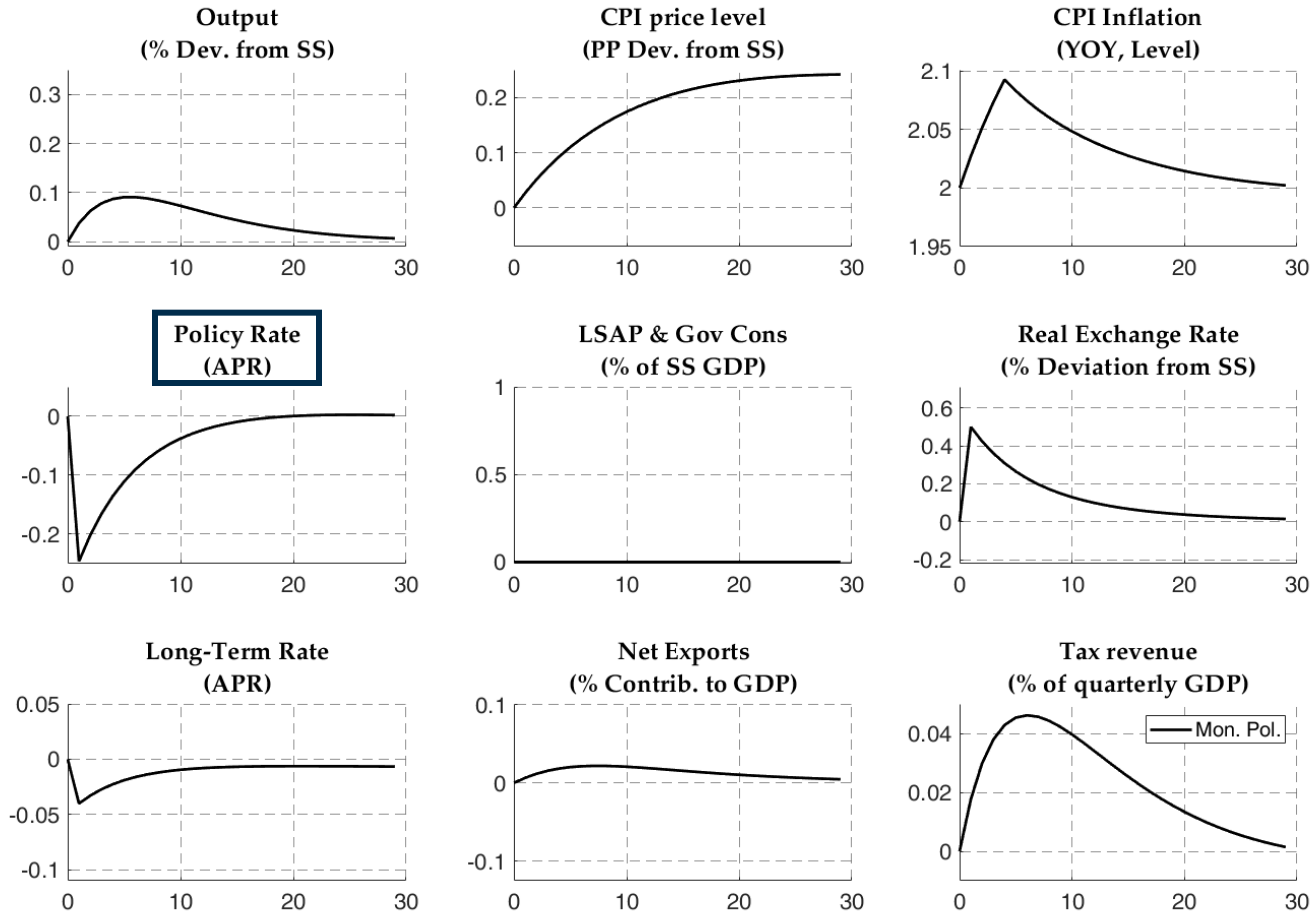
where $GD_t \quad = \frac{B_t^f + \frac{1}{1-\kappa}B_{L,t}^f}{4P_t Y}$ (face value)

The Role of Open Economy Dynamics

Transmission of monetary and fiscal policy : Baseline Calibration – Mon Pol

Transient Interest Rate Cut with 25 bpts – Well-Known Effects:

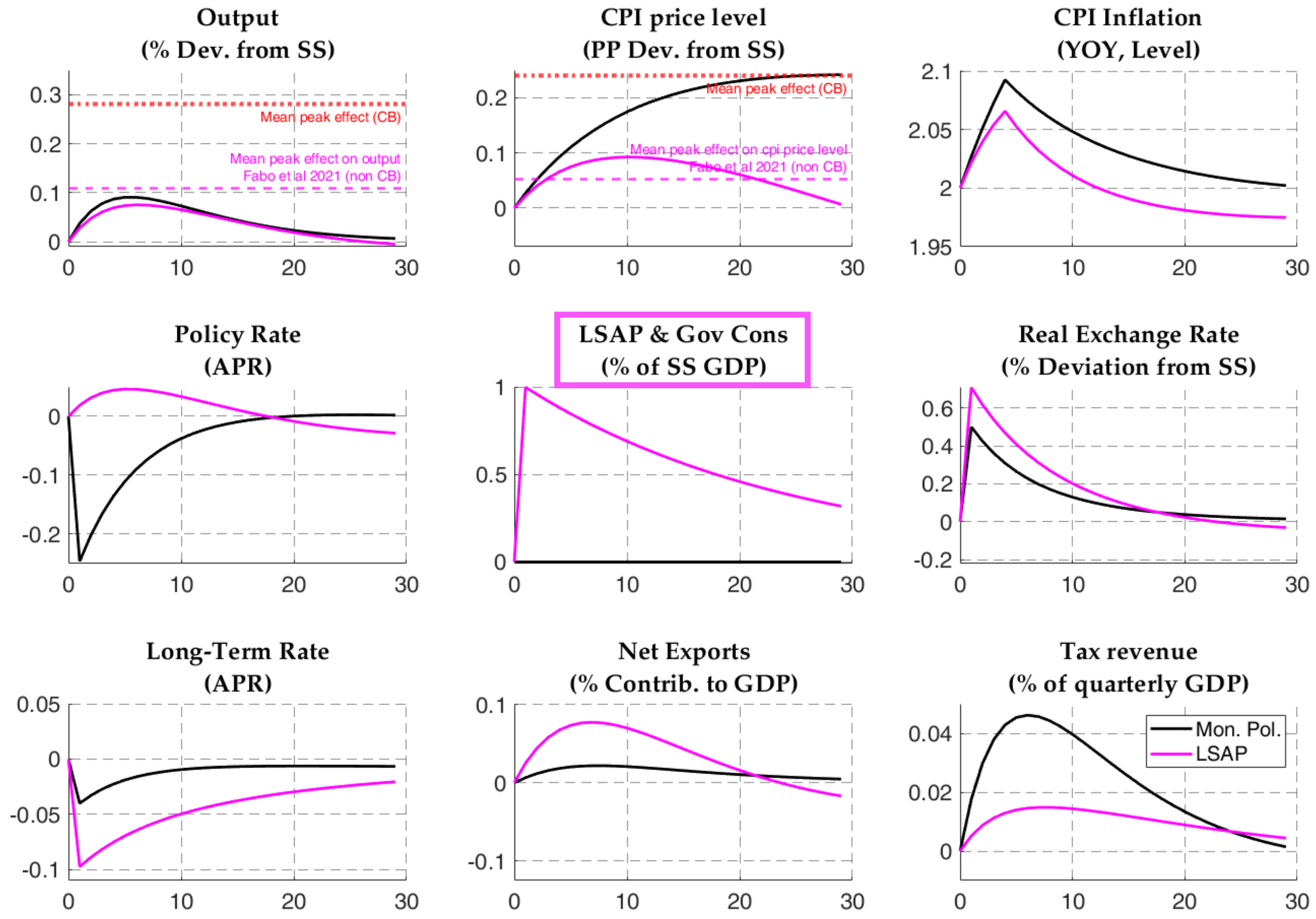
- Long-term interest rate declines slightly
- GDP increases by approximately 0.1 %
- The exchange rate depreciates by about 0.5 %
- Inflation rises by approximately 0.1 pp



Transmission of monetary and fiscal policy : Baseline Calibration – LSAP

LSAP with 1 % of GDP
– Modest Effects:

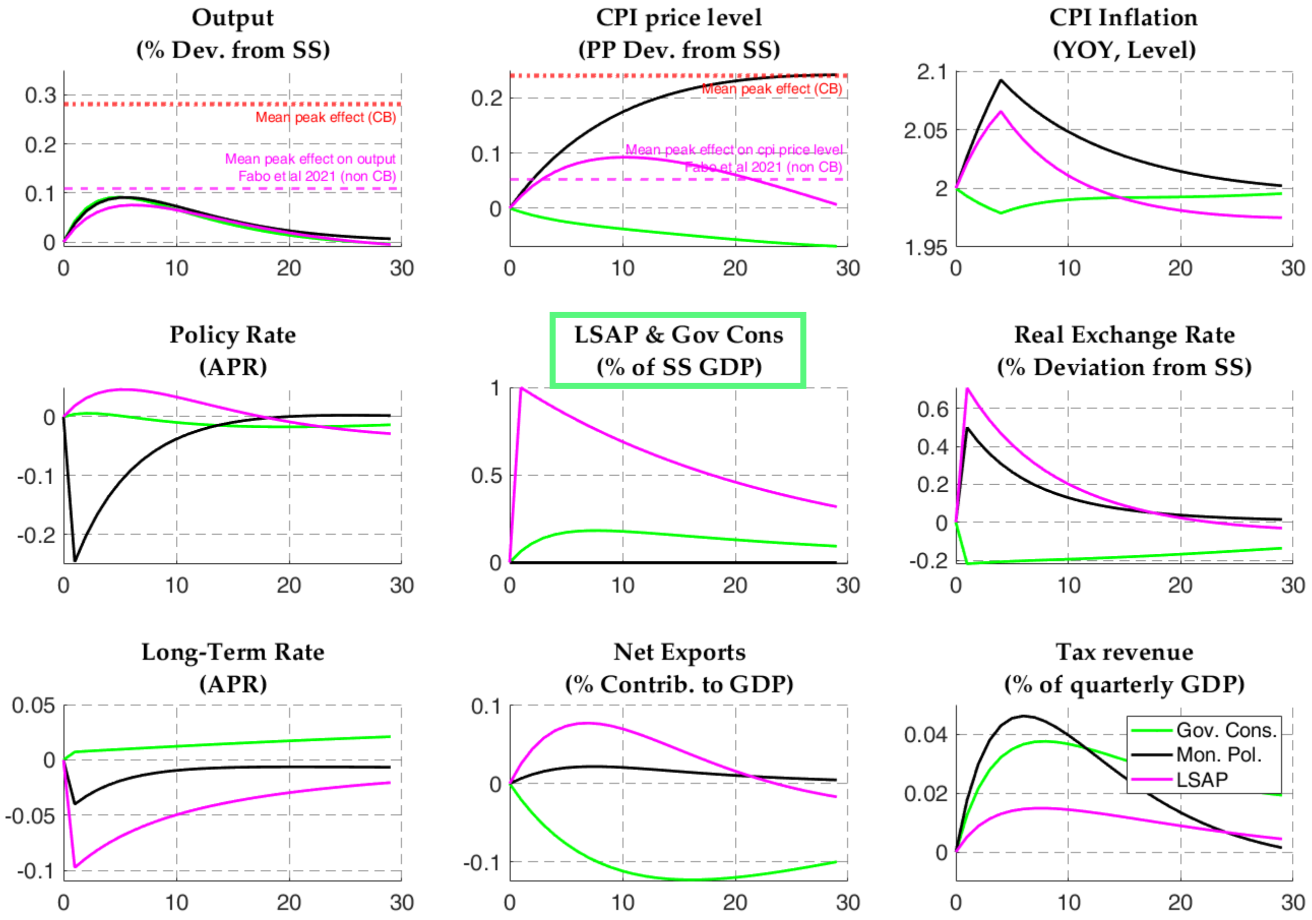
- Long-term interest rate declines
- GDP ~ 0.1 % (NX~0.06)
- The exchange rate depr by about 0.7 %
- Inflation rises by approximately 0.06 pp



Transmission of monetary and fiscal policy : Baseline Calibration – Gov Cons

Fiscal Policy – Well-Known Effects:

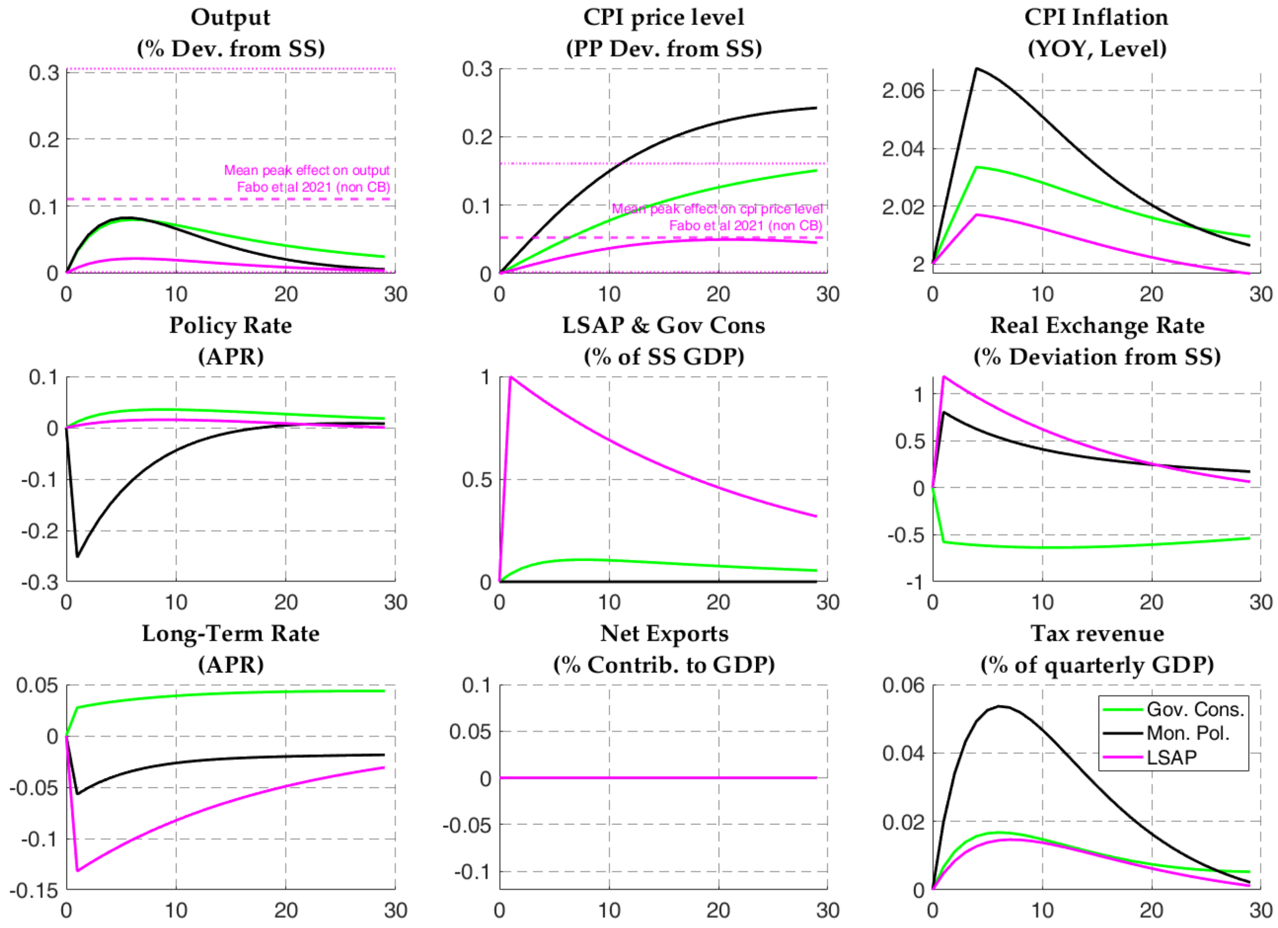
- Long-term interest rate increases
- GDP increases by approx 0.1 % (Multiplier of dY/dG ≈ 0.9)
- The exchange rate appr by about 0.2 %
- Inflation declines slightly (Similar effects as in NIER's newly estimated model)
- Budget elasticity ≈ 0.5



Transmission of monetary and fiscal policy : Closed Economy Variant (Trade Autarky)

Exports and Imports are shut down by setting the home-bias parameter $\eta_c = \eta_g = 1$ and the elasticity of substitution across consumption goods to infinity ($\nu = \infty$).

Key finding: Higher Govt consumption now leads to higher inflation.

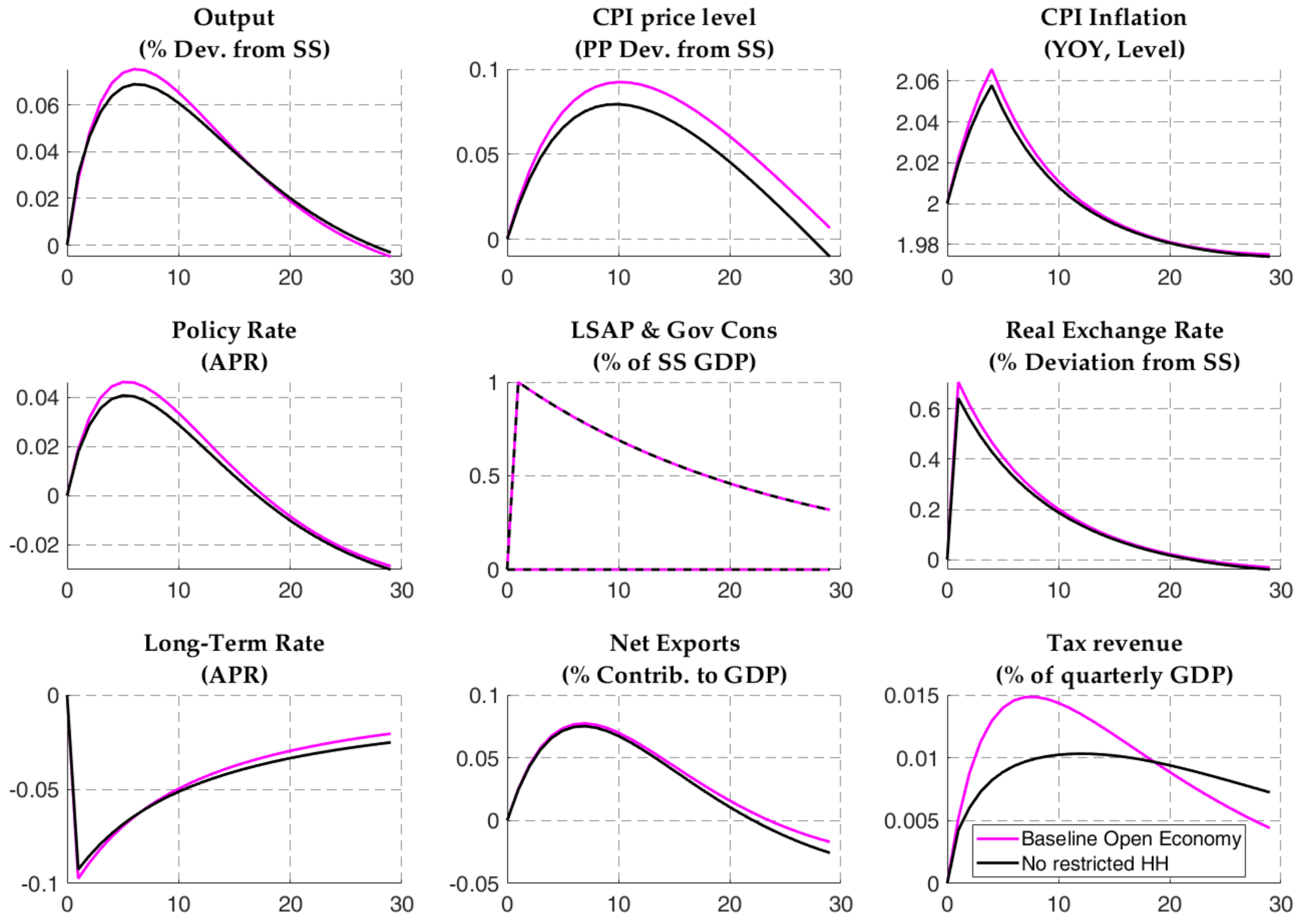


Transmission of unconventional monetary policy: No Domestic Bond Market Segmentation

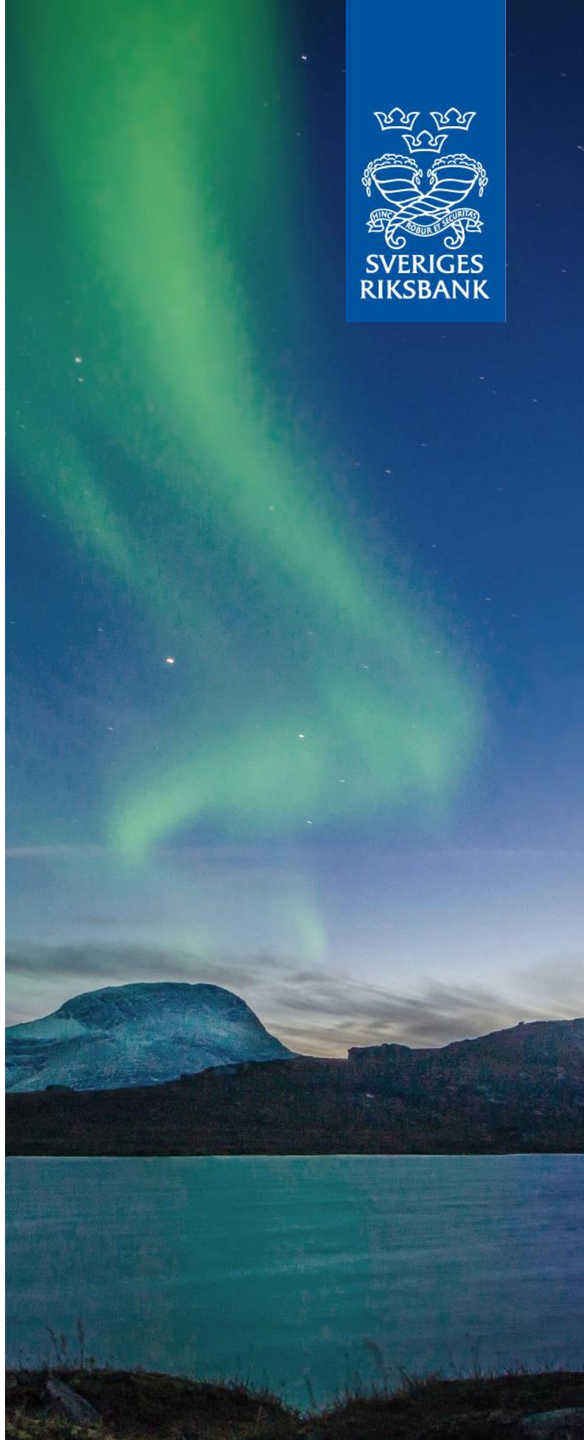
We model this by setting $\omega_r = 0$

- i.e. no restricted HH and no direct impact of LSAPs on consumption
- closely resemble the baseline results where $\omega_r > 0$.

Key finding: Exchange rate channel crucial for effects of QE in our model.



Case Study: Assessing the Impact of the Riksbank's Unconventional Monetary Policy



Quantifying the Effects of Unconventional Monetary Policy: Sequentially Matching Real-Time Policy Events, 2015–2019

1. At period 0 (2014Q4): Set the state of the economy at end-2014 so that the ZLB is just about to be binding (i.e. replicate the actual policy situation in 2014Q4).

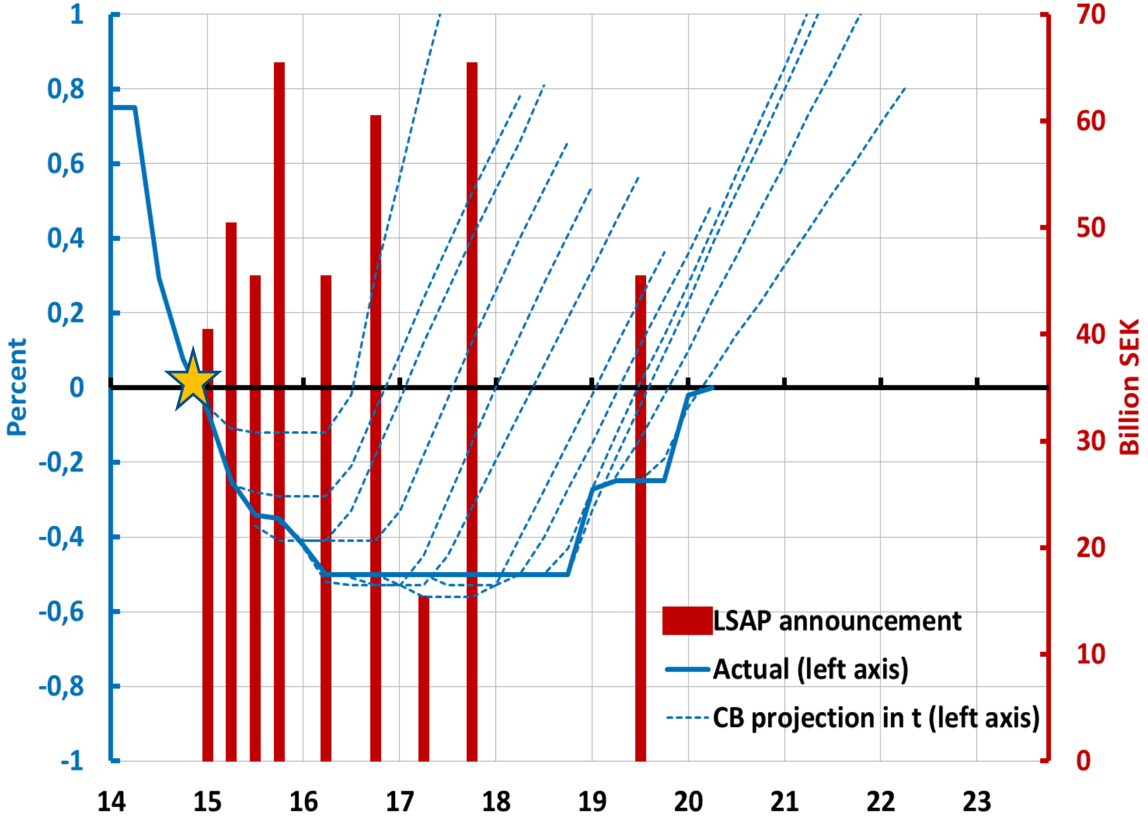
2. At period 1 (2015Q1):
   1. Replicate announced LSAP plans ($\boldsymbol{\varepsilon_t^{QE}} + \boldsymbol{\varepsilon_{t+1}^{QE}} + \boldsymbol{\varepsilon_{t+2}^{QE}} + \cdots$)
   2. Implement NIRP ($\boldsymbol{\lambda_t} = \mathbf{0} \rightarrow \boldsymbol{\lambda_t} < \mathbf{0}$) and (adverse) demand shocks ($\varepsilon_t^d < 0$) to replicate Riksbank's rate path

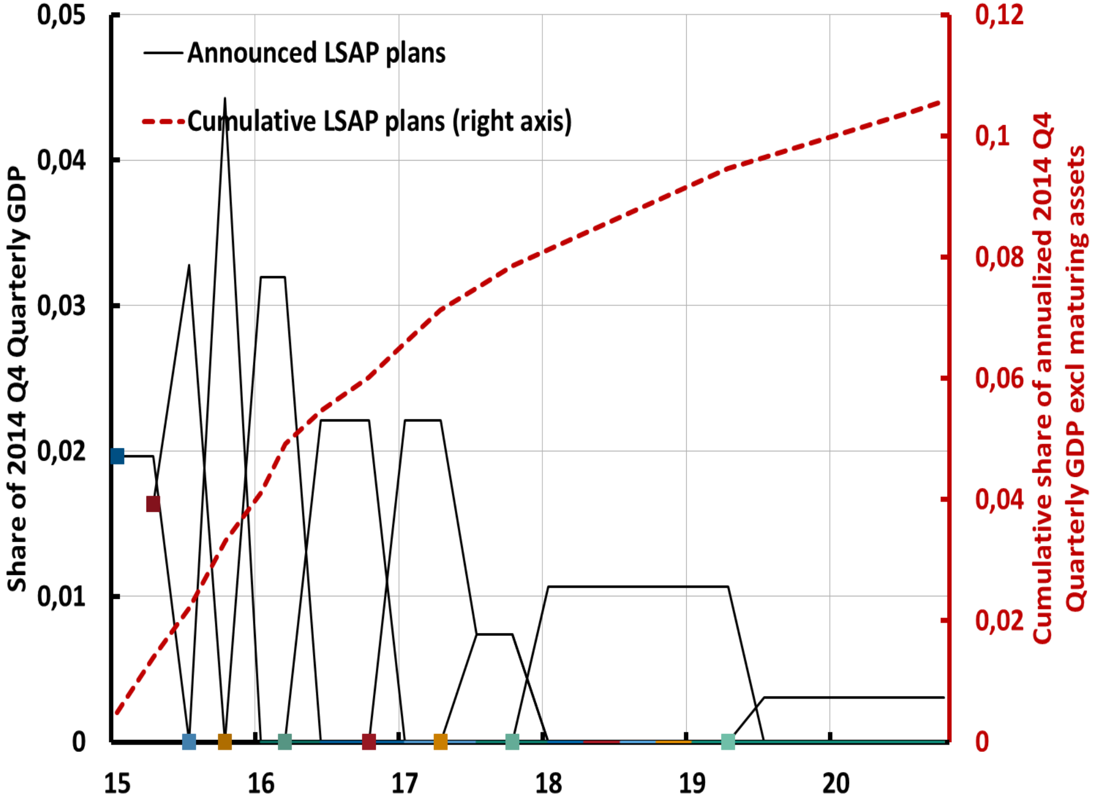
3. At period 2+ (2015Q2-2019Q4):
   - Repeat Step 2 for all quarters 2015-2019.

4. Finally - Simulate counterfactual scenarios (all with the adverse demand shocks remaining; $\varepsilon_t^d < 0$):
   - LSAP = 0 ($\boldsymbol{\varepsilon_t^{QE}} + \boldsymbol{\varepsilon_{t+1}^{QE}} + \cdots = 0$) and ELB < 0 ($\boldsymbol{\lambda_t} < \mathbf{0}$).
   - LSAP > 0 ($\boldsymbol{\varepsilon_t^{QE}} + \boldsymbol{\varepsilon_{t+1}^{QE}} + \cdots > 0$) and ELB = 0 ($\boldsymbol{\lambda_t} = \mathbf{0}$).
   - No UMP ($\boldsymbol{\varepsilon_t^{QE}} + \boldsymbol{\varepsilon_{t+1}^{QE}} + \cdots = 0$ and $\boldsymbol{\lambda_t} = \mathbf{0}$).
   - No UMP ($\boldsymbol{\varepsilon_t^{QE}} + \boldsymbol{\varepsilon_{t+1}^{QE}} + \cdots = 0$ and $\boldsymbol{\lambda_t} = \mathbf{0}$) but with fiscal policy $\boldsymbol{g_t} > \mathbf{0}$.

5. Study effects on relevant economic variables but also on fiscal position and consolidated government debt.

3 Riksbank Negative Policy Rates Forecasts and Announced Asset Purchase Plans



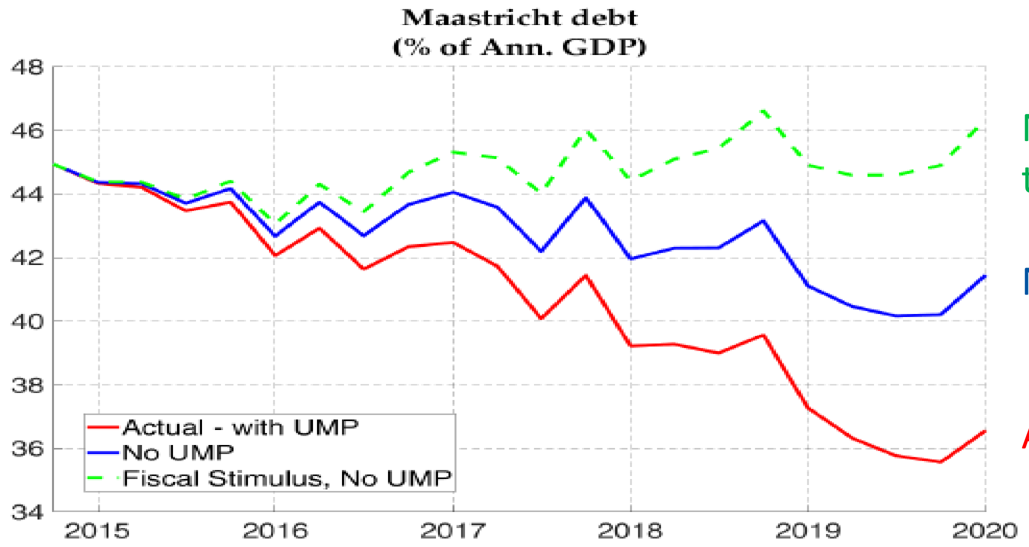


Assessing the Impact of the Riksbank's Unconventional Monetary Policy and what if fiscal policy would have been used instead of UMP?

Alternative fiscal-monetary policy mixes that stimulates output equally, leads to the same output path are associated with drastically different fiscal consequences.

UMP => -5% lower debt,

Fiscal Stimulus => 5% *higher* debt

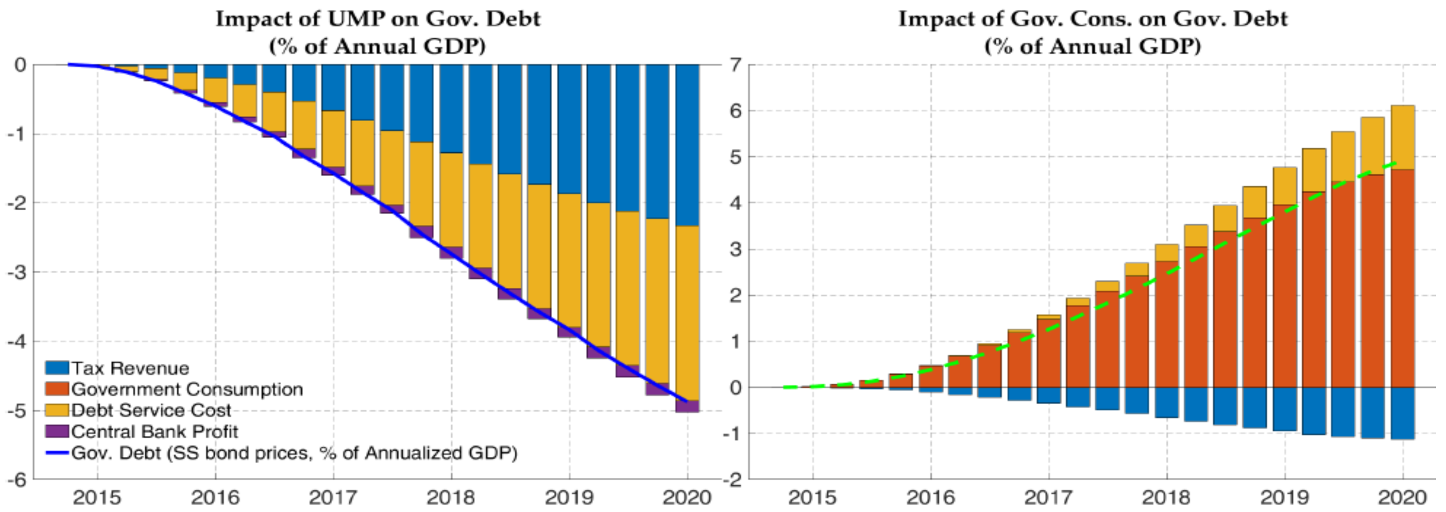


No UMP but G>0 (to yield the same dY as UMP)

No UMP (LSAP = 0 and ELB = 0)

Actual – with UMP

Panel C: Decomposition of Contributions to Government Debt



Concluding Remarks

4 Conclusions

- Key Finding:
  - We show that the exchange rate plays a critical role to amplify the impact of UMP while it attenuates the effectiveness of conventional fiscal policy to jointly boost output and inflation.
  - LSAPs can be effective even if consumers are not directly affected by long-term yields.
- Tentative Policy Implications
  - Swedish case study (2015-2019):
    - Riksbank's UMP: 5% of GDP fiscal improvement (compare with ~1% CB loss).
    - Fiscal stimulus: 5% of GDP fiscal cost.
  - NIRP and LSAPs as Policy Tools
    - While the ex post fiscal gains appear to have been substantial, LSAPs are associated with notable ex ante risks for the central bank balance sheet and may also carry risk for the consolidated fiscal position (Adrian et al., 2025).
    - Unclear how far short-term policy rates may be cut, so UMP tools may need to be complemented by fiscal stimulus (transfers, investment, …).

Extra slides

Portfolio frictions

- All households maximize a utility functional given by:

$$U_t^j = \mathbb{E}_t^j \sum_{s=0}^{\infty} \beta_j^s \, \varepsilon_{t+s}^d \left[\frac{\left(c_{t+s}^j - \varkappa \bar{c}_{t+s-1}^j\right)^{1-\sigma}}{1-\sigma} - \frac{\left(n_{t+s}^j\right)^{1+\varphi}}{1+\varphi} \right] \qquad c_t = \left(\eta_c^{\frac{\nu-1}{\nu}} y_{H,t}^{\frac{1}{\nu}} + (1-\eta_c)^{\frac{\nu-1}{\nu}} y_{F,t}^{\frac{1}{\nu}} \right)^{\nu}$$

- The model economy includes two types of nominal assets in the home (H) and the foreign (F) economies respectively: short-term bonds and long-term bonds. The holdings of these assets by agents of type j are denoted as $B_{k,t}^j$ and $B_{k,L,t}^j$ for $k = \{H, F\}$.

- Unrestricted households face the budget constraint:

$$P_t(1+\tau_t^c)c_t^u + B_{H,t}^u + \left(1+\zeta_{H,t}\right)P_{L,t}B_{H,L,t}^u + \left(1+\zeta_{F,t}\right)S_t P_{L,t}^* B_{F,L,t}^u + T_t^u$$
$$= R_{t-1}B_{H,t-1}^u + P_{L,t}R_{L,t}B_{H,L,t-1}^u + S_t P_{L,t}^* R_{L,t}^* B_{F,L,t-1}^u + W_t(1-\tau_t^n)\bar{n}_t^u + D_t^u + \Xi_t^u$$

- The portfolio friction (“tax” on long-term bonds) facing unrestricted agents is given by:

$$\frac{1+\zeta_{k,t}}{1+\zeta_k} = \left(\frac{P_{L,t} b_{k,L,t}^u}{P_L b_{k,L}^u} \right)^{\xi}$$

- Restricted households face the same budget constraint except they face no portfolio frictions on long-term bonds and can’t hold short-term bonds or foreign long term bonds

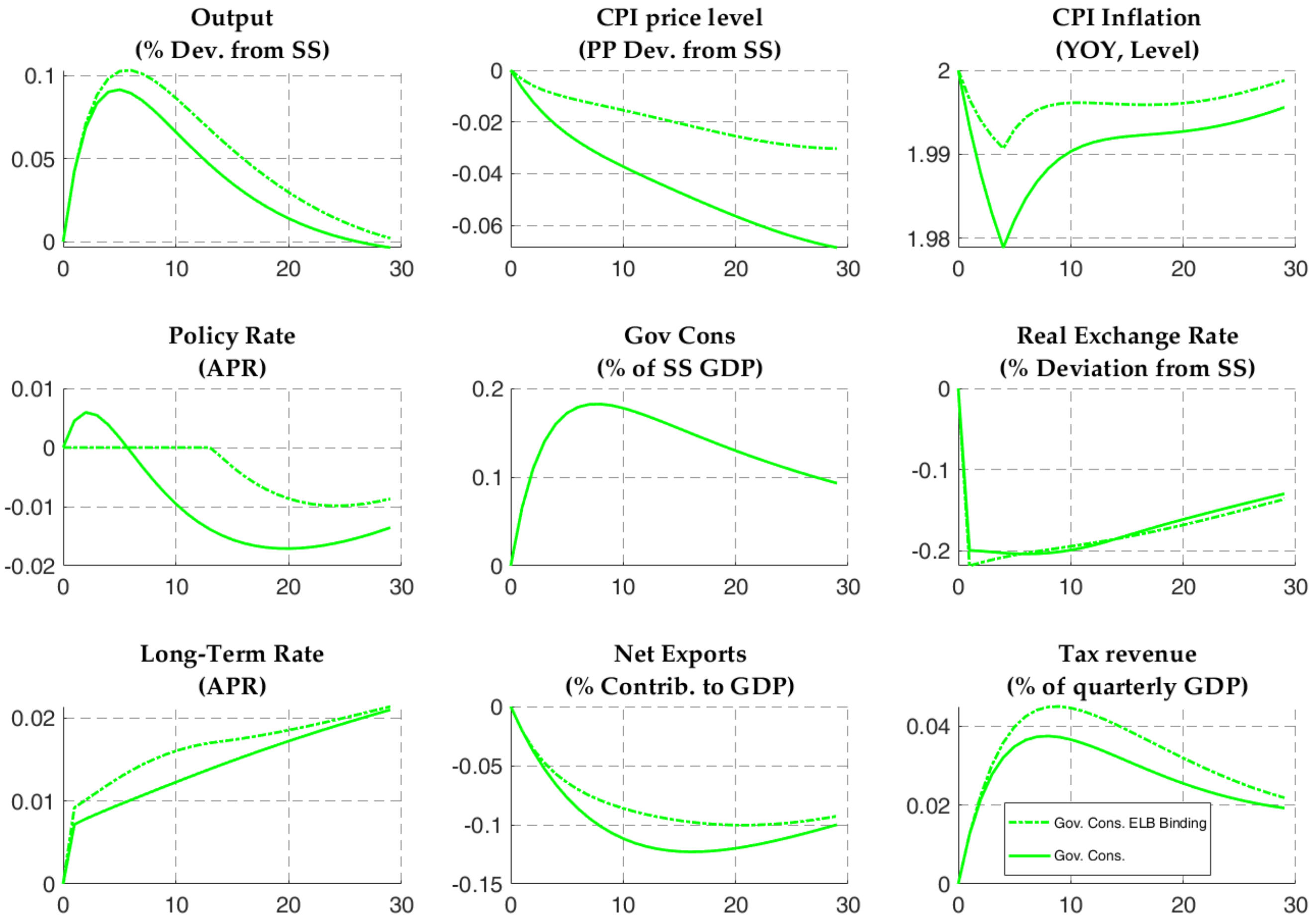
Transmission of fiscal policy: w/o Binding ELB

A binding ELB does not materially change the overall results in the previous slides:

- GDP is slightly higher
- Muted CPI response due to non-linear PC

- Hence, previous findings that the ELB significantly amplify the transmission of government consumption is not a feature in our small open economy with segmented bond markets and debt financed spending.

The dashed lines show the effects of LSAPs and Gov Cons when the economy has been hit by negative demand shocks which makes the ELB binding.



Transmission of LSAP: w/o Cogn. Discounting

LSAPs: With vs. Without Cognitive Discounting

No discounting (dashed): Stronger effects on output, inflation, and policy rate.

With discounting (solid): Macro responses dampened, but long-term rates move more persistently.

Key insight: Myopia weakens forward-guidance power while amplifying long-term yield effects.

The result illustrates a key insight from Kolasa et al. (JME, 2025):

Myopia **reduces forward guidance power** and attenuates exchange-rate driven transmission.
•Rational expectations magnify policy effects on macro variables, but with smaller impact on long yields.