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ECB

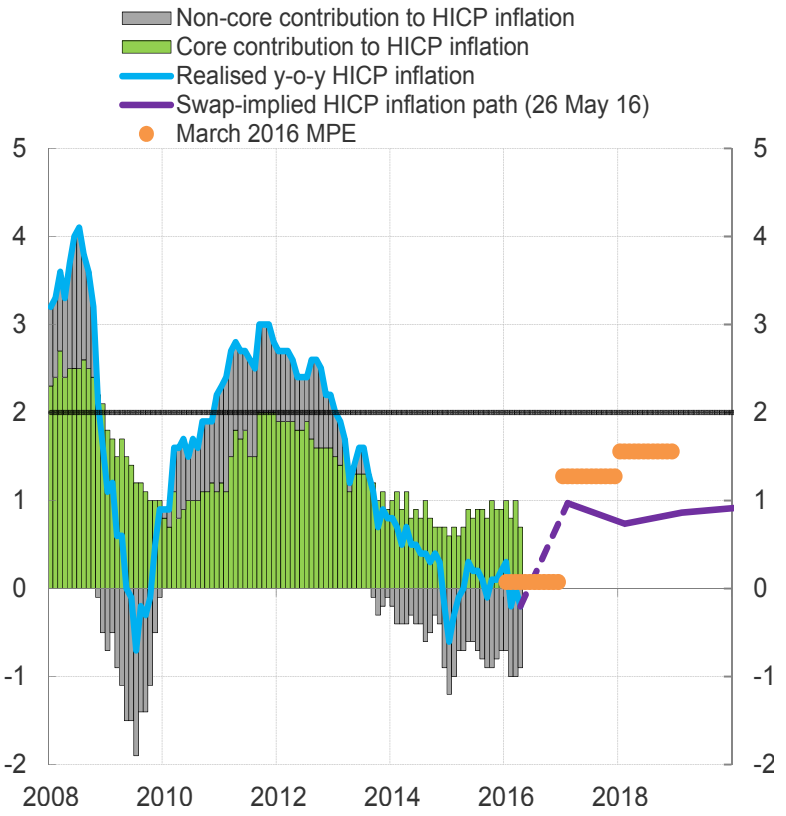
Breaking through the zero line
The ECB's Negative Interest Rate Policy

Negative interest rates: Lessons learned...so far
Brookings Institute, Washington DC, 6 June 2016

The views expressed in this presentation are those of the presenters and do not necessarily reflect those of the ECB or the Eurosystem

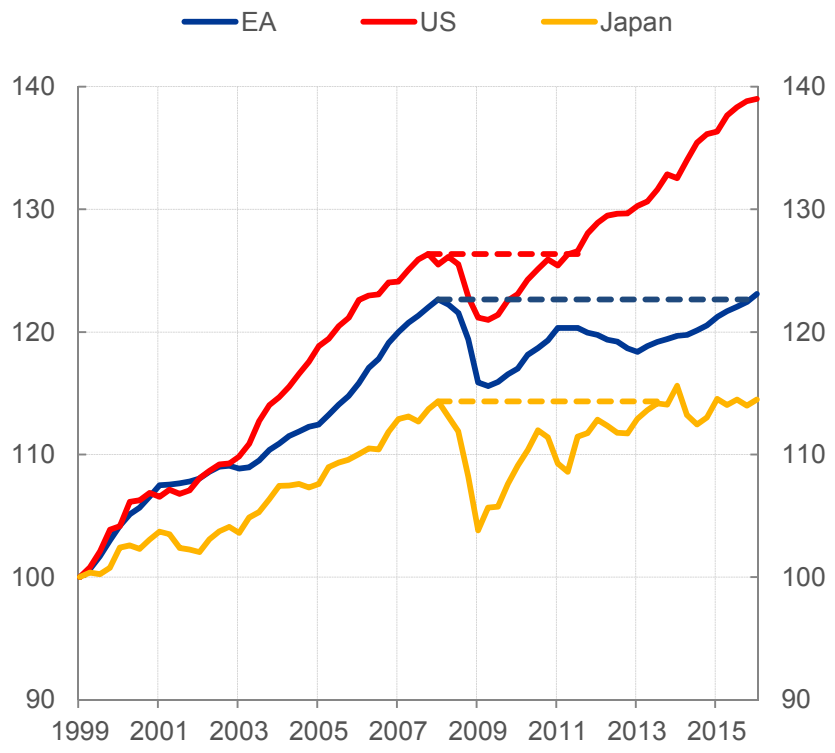
Backdrop: Weak inflation outlook and sluggish recovery

Euro area HICP inflation
(year-on-year percent change)



Sources: Thomson Reuters, Eurostat, ECB calculations.
Latest observation: April 2016 for HICP and 26 May 2016 for swap-implied inflation path.

Real GDP
(Index, 1999Q1=100)

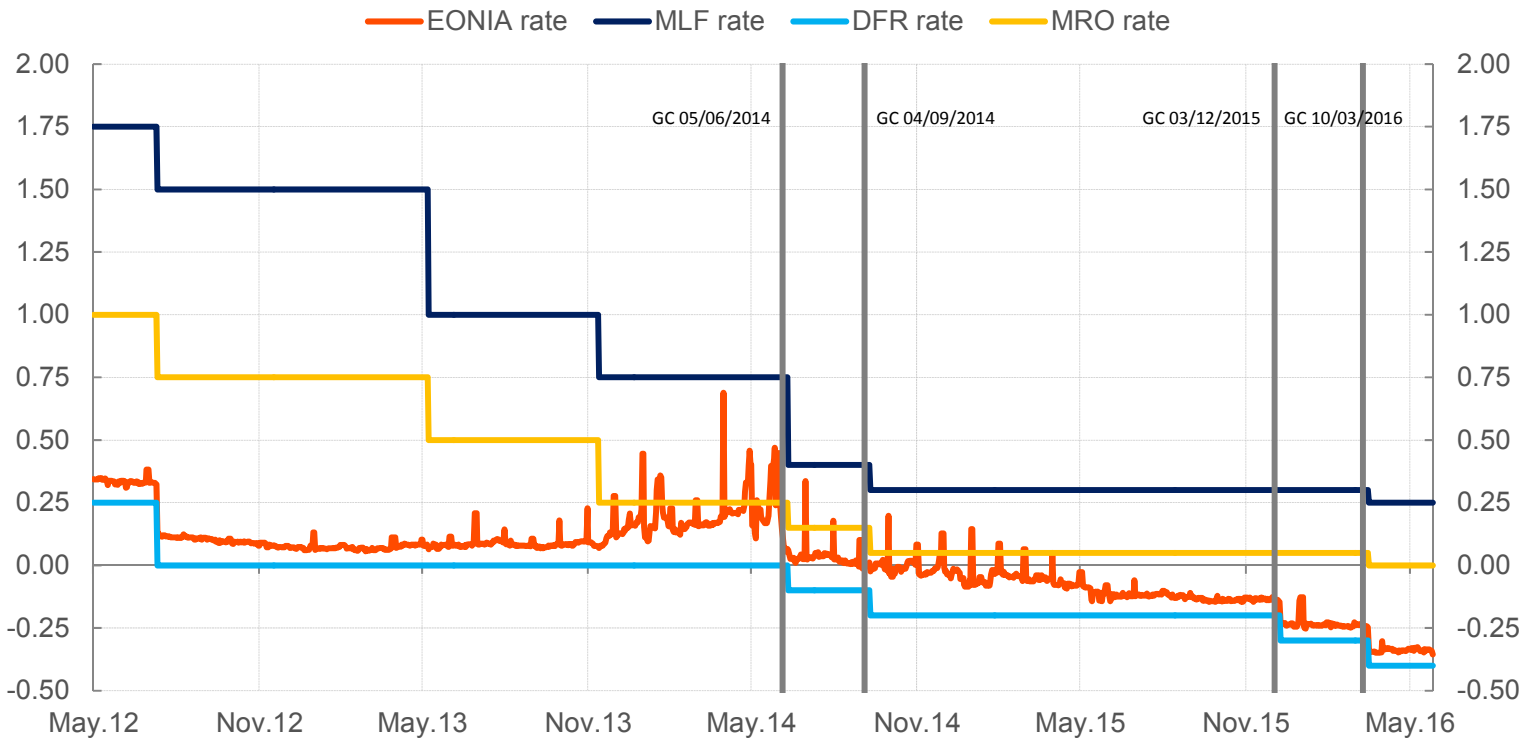


Sources: Eurostat, BEA, Cabinet Office, ECB calculations.
Notes: horizontal dotted lines represent pre-crisis peak real GDP level.
Latest observation: 2016 Q1.

Four small steps into the negative

ECB policy rates and overnight money market rates May 2012 – May 2016

(percent)



Sources: ECB and Reuters.
Latest observation: 26 May 2016.

Overview

A **Why? NIRP rehabilitates monetary policy in a low rate world**

B **A simple model exercise: NIRP versus ZLB plus forward guidance**

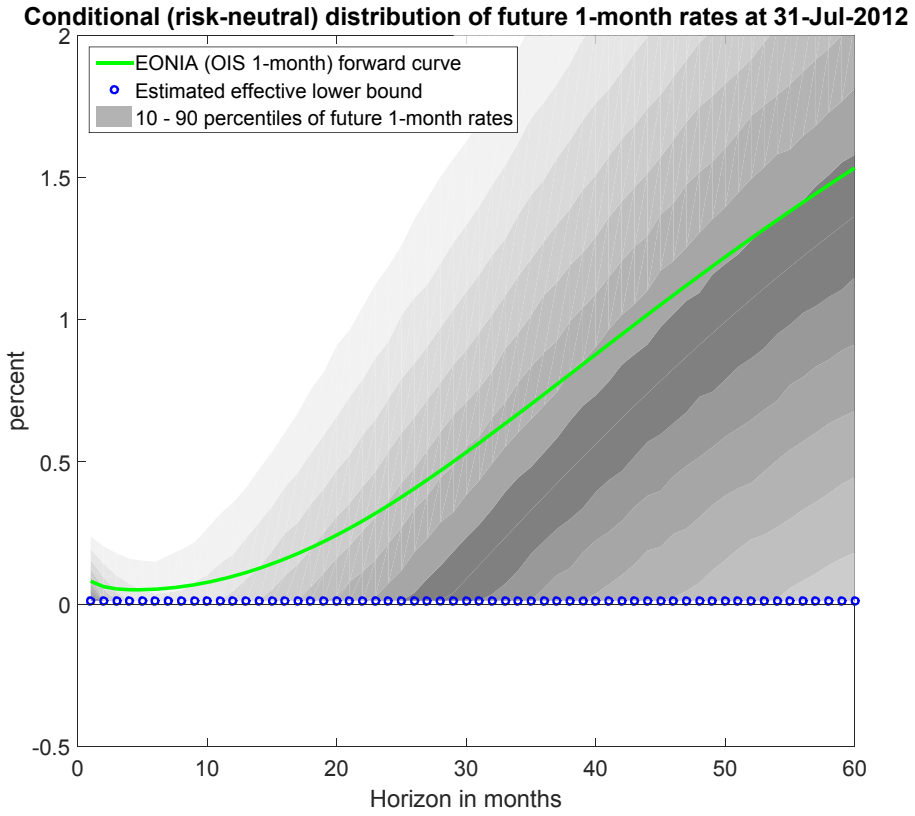
C **Transmission**

D **Negative side effects of negative rates?**

E **Outlook and open issues**

Why? NIRP rehabilitates monetary policy in low rate world

Short-term interest rate expectations when the effective *lower bound is zero* *(percent p.a.)*



Source: ECB calculations, based on Lemke/Vladu (2016).
Notes: The chart presents the sequence of risk-neutral predictive distributions of the one-month OIS rate, conditional on term structure information on the indicated date, together with the model-implied one-month forward curve. The results are from a 3-factor arbitrage-free shadow rate term structure model for the euro area EONIA swap curve. The model allows for a shift in the lower bound. Note that for short-term horizons, the model can imply that the risk-neutral probability of the short rate sticking to the lower bound is close to one, so that only high percentiles (or none at all) of the predictive distribution are visible.

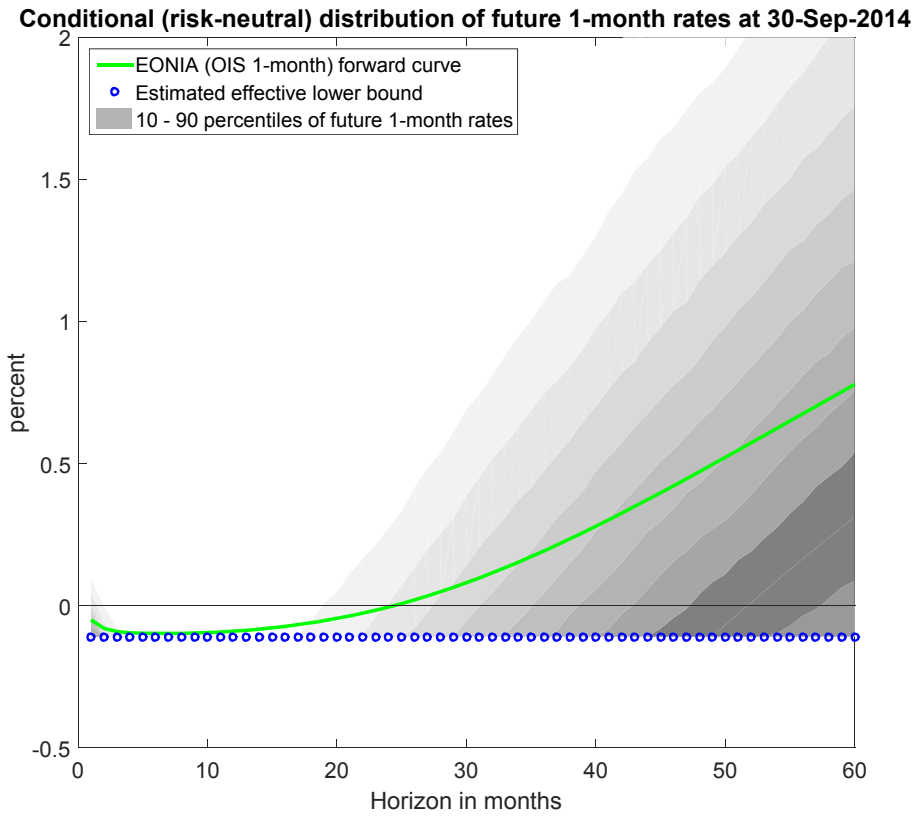
A *calamitous misadventure*?

Why a negative interest rate policy

- **Removes non-negativity restriction on future *expected short rates*:** forward curve becomes flatter than it would be if short rates were expected to be constrained by a zero lower bound

Why? NIRP rehabilitates monetary policy in low rate world

Short-term interest rate expectations when the effective *lower bound is negative* *(percent p.a.)*



Source: ECB calculations, based on Lemke/Vladu (2016).
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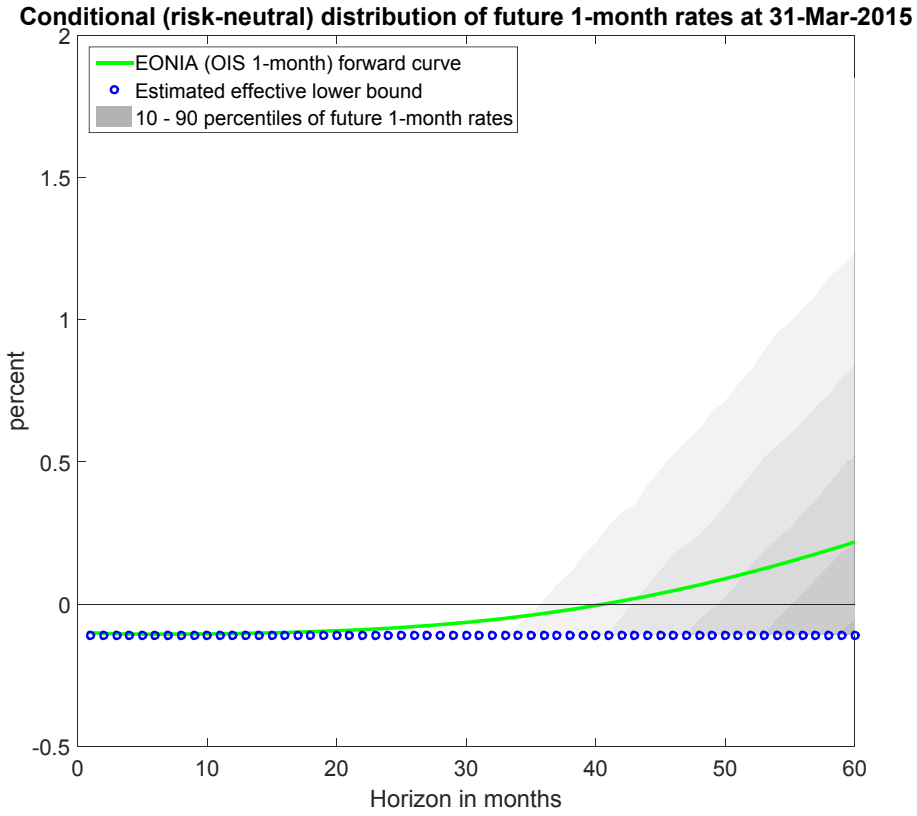
Why? NIRP rehabilitates monetary policy in low rate world

Short-term interest rate expectations under *negative rates and APP* *(percent p.a.)*



Source: ECB calculations, based on Lemke/Vladu (2016).
Notes: The chart presents the sequence of risk-neutral predictive distributions of the one-month OIS rate, conditional on term structure information on the indicated date, together with the model-implied one-month forward curve. The results are from a 3-factor arbitrage-free shadow rate term structure model for the euro area EONIA swap curve. The model allows for a shift in the lower bound. Note that for short-term horizons, the model can imply that the risk-neutral probability of the short rate sticking to the lower bound is close to one, so that only high percentiles (or none at all) of the predictive distribution are visible.

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Overview

A	Why? NIRP rehabilitates monetary policy in a low rate world
B	**A simple model exercise: NIRP versus ZLB plus forward guidance**
C	Transmission via banks and macroecomic impact
D	Negative side effects of negative rates?
E	Outlook and open issues

A simple model: the bond market

- Simple 2-period model with representative investor
- Investor allocates time *t* wealth W_t into one-period and two-period bonds to maximize next period's expected wealth W_{t+1} minus variance penalty:

$$\max [E(W_{t+1}) - \tfrac{1}{2} \gamma Var(W_{t+1})]$$

- First-order condition gives demand B for long-term bonds:

$$B = [Var(R^1_{t+1})]^{-1} \cdot [2 R^2_t - R^1_t - E(R^1_{t+1})]$$

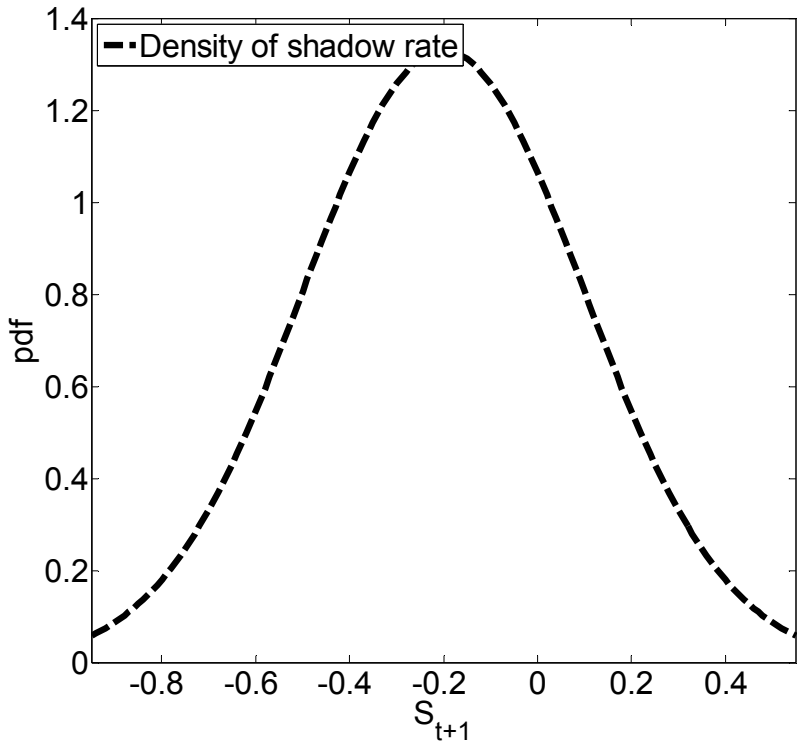
where R^n_t is the yield to maturity of an *n*-period bond at time *t*.

- Short-term bond is in elastic supply, rate set by the central bank
- Fixed supply Q of long-term bonds: in equilibrium $Q=B$.
- Two-year yield in equilibrium:

$$R^2_t = \underbrace{\tfrac{1}{2} \cdot [R^1_t + E(R^1_{t+1})]}_{\text{Expectations component}} + \underbrace{\tfrac{1}{2} \gamma Q Var(R^1_{t+1})}_{\text{Term premium}}$$

Simple model: The policy rate in "normal times"

Distribution of Central Bank's intended (=shadow) policy rate *S* next period



Sources: ECB calculations.
Notes: Hypothetical and illustrative example with current and intended short rate S_t equal to -0.2%, $\beta = 1.2$ and $\sigma^2_\pi = 0.25$.

- Central bank (CB) follows (simplified and modified) Orphanides/Wieland rule, so that the intended short rate S_t is

$$S_t = S_{t-1} + \beta \cdot (\pi_t - \pi_{t-1}),$$

where $\pi_t - \pi_{t-1} \sim N(0, \sigma^2_\pi)$

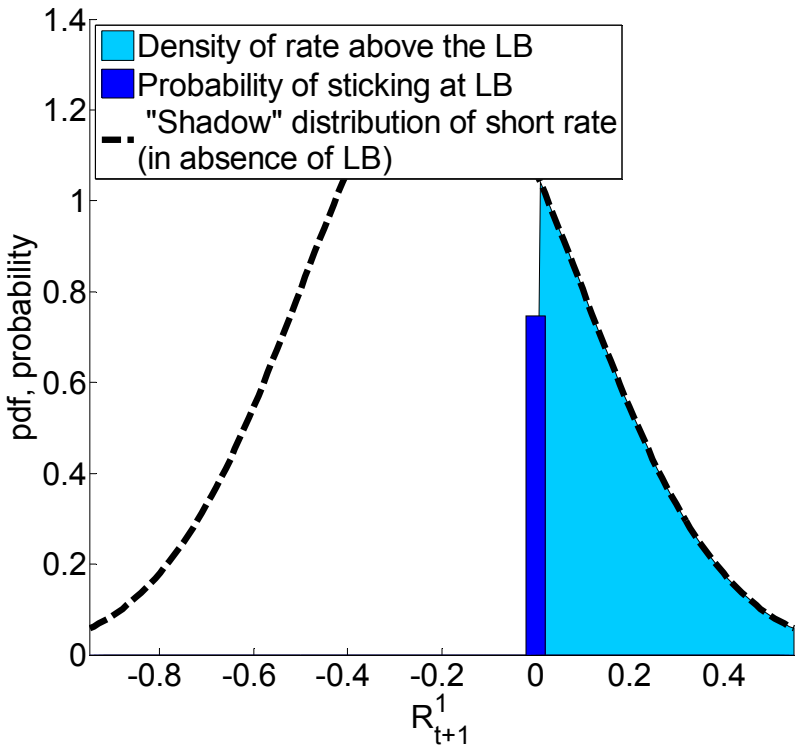
- Distribution of next period's intended policy (='shadow') rate is a simple normal:

$$S_{t+1} \sim N(S_t, \beta^2 \sigma^2_\pi)$$

- In "normal times", when $E(R^1_{t+1}) = E(S_{t+1})$

Simple model: The policy rate close to the lower bound

Distribution of short-term rate *R* next period



Sources: ECB calculations.
Notes: Hypothetical and illustrative example with current and intended short rate S_t equal to -0.2%, β = 1.2 , σ^2_π = 0.25, and lower bound LB=0, hence actual current short rate R^1_t = LB = 0. Expected future short rate $E(R^1_{t+1})$ = 4 bps.

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where $\pi_t - \pi_{t-1} \sim N(0, \sigma^2_\pi)$

- Distribution of next period's intended policy (='shadow') rate is a simple normal:

$$S_{t+1} \sim N(S_t, \beta^2 \sigma^2_\pi)$$

- But if CB is constrained by lower bound (***LB***):

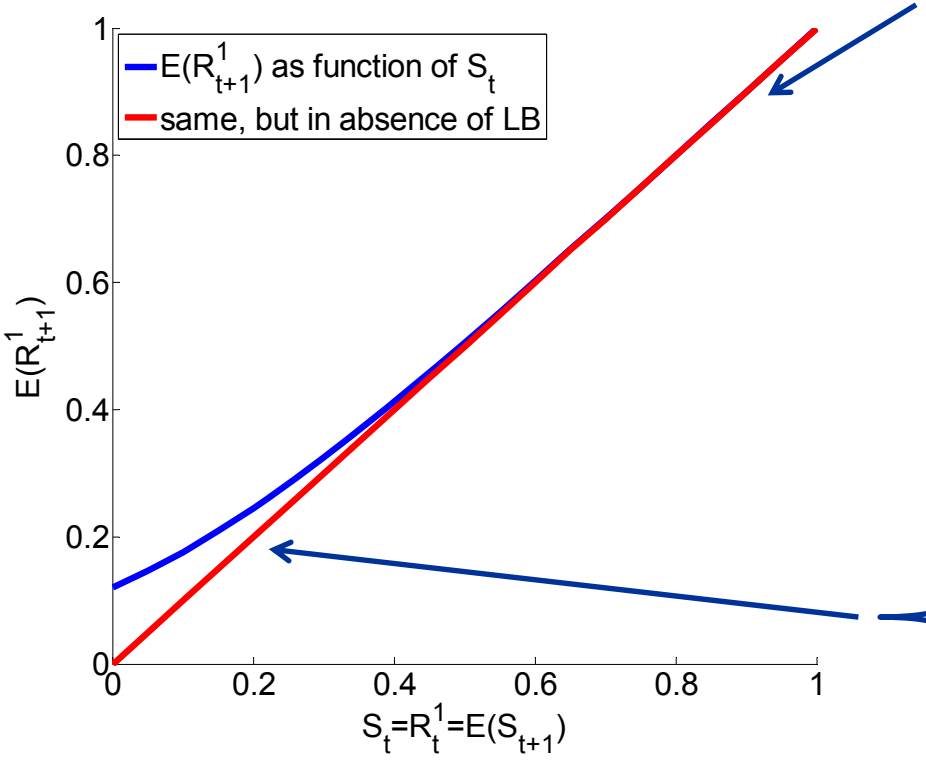
$$R^1_t = max\{LB, S_t\}$$

- … and the predictive distribution of the actual short rate is a censored normal with

$$E(R^1_{t+1}) = LB + (S_t - LB) \cdot \Phi[(S_t - LB)/(\beta \sigma_\pi)] + \beta \sigma_\pi \phi[(S_t - LB)/(\beta \sigma_\pi)]$$

Simple model: ZLB reduces influence on term structure

Relation between current policy rate *S* and expected next period's short-term rate *R*
(percent)



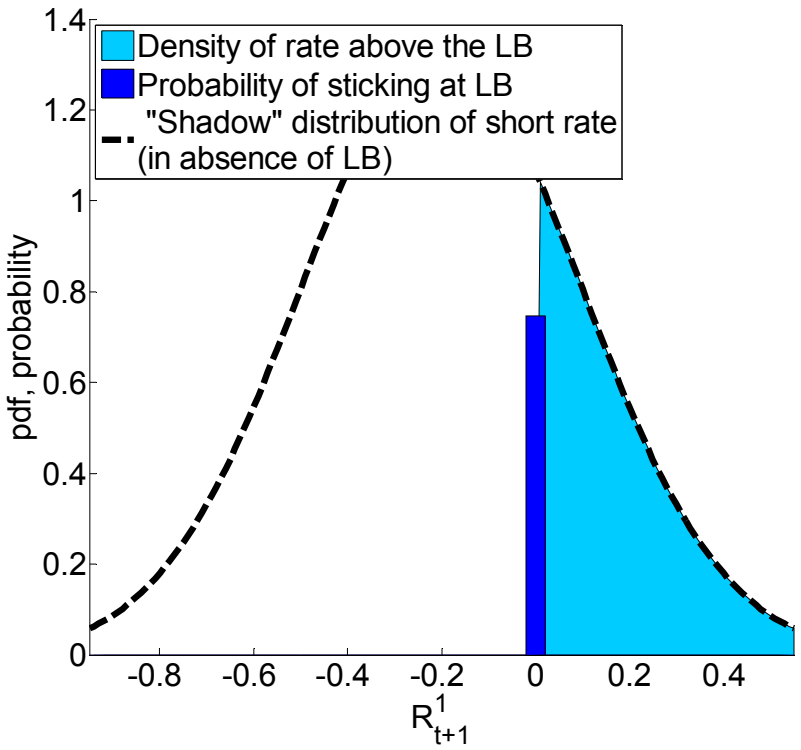
Sources: ECB calculations.
Notes: Hypothetical and illustrative example with current and intended short rate S_t equal to -0.2%, β = 1.2, σ^2_π = 0.25, and lower bound LB=0.

- When CB rates (= current short rates) are high above the LB, then
  - $E(R^1_{t+1}) = E(S_{t+1})$
  - Relation between current policy rate $R^1_t = S_t$ and expected future short rate $E(R^1_{t+1})$ is almost linear

- When CB rates approach the ***LB***, then
  - $E(R^1_{t+1}) > E(S_{t+1})$
  - Relation between current policy rate R^1_t and expected future short rate $E(R^1_{t+1})$ convex: rate reductions have weaker and weaker impact on $E(R^1_{t+1})$ and (under certain conditions) on R^2_t

Simple model: Under ZLB, $E(R^1_{t+1})$ is biased upwards

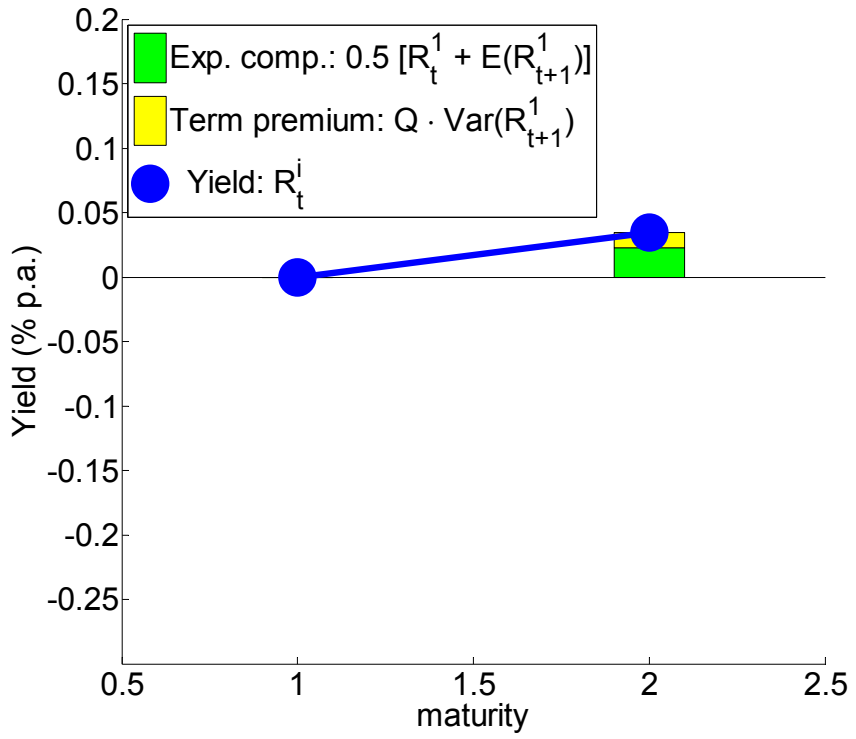
Distribution of short-term rate R next period



Sources: ECB calculations.
Notes: Hypothetical and illustrative example with current and intended short rate S_t equal to -0.2%, β = 1.2 , σ^2_π = 0.25, and lower bound LB=0, hence actual current short rate R^1_t = LB = 0. Expected future short rate $E(R^1_{t+1})$ = 4 bps.

Term structure of interest rates

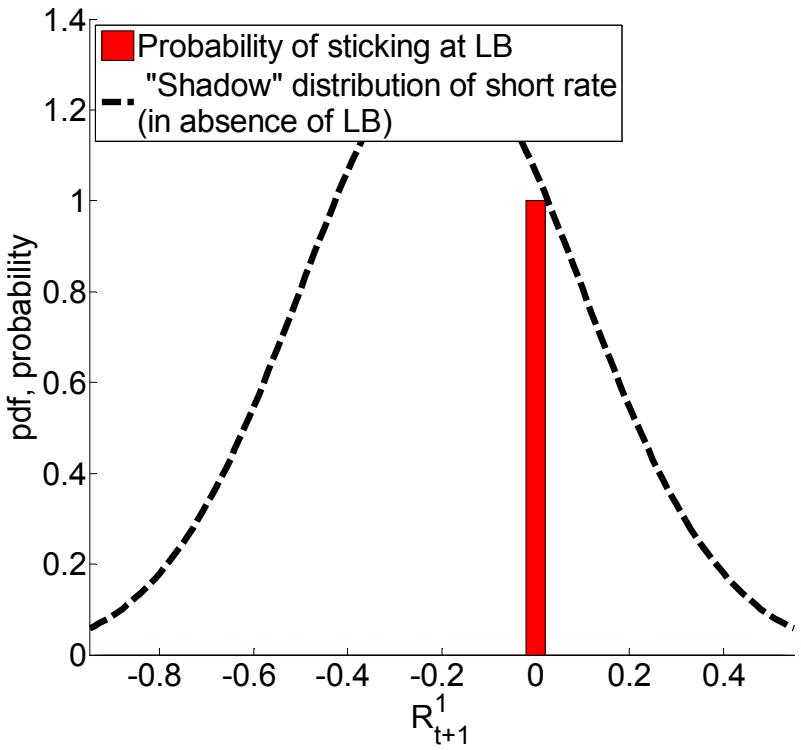
(percent p.a.)



Sources: ECB calculations.
Notes: Yield (=3 bps) decomposition into expectational component (2 bps) and term premium (1 bp), with 'risk aversion' parameter γ=2.and Q=1.

Option 1: ZLB plus credible forward guidance on $R^1_{t+1} = 0$

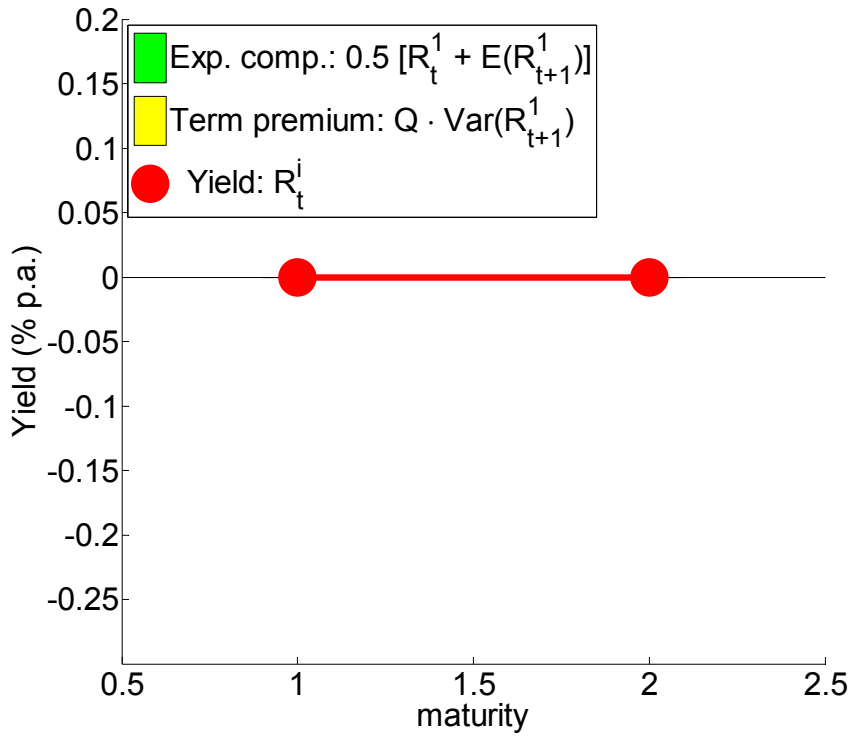
Distribution of short-term rate R next period



Sources: ECB calculations.
Notes: Hypothetical and illustrative example with current short rate S_t equal to -0.2%, β = 1.2 and σ^2_π = 0.25, and lower bound LB=0, hence actual current short rate R^1_t = LB = 0. Unconditional ('Odyssean') forward guidance makes markets expect R^1_{t+1} = 0 with certainty.

Term structure of interest rates

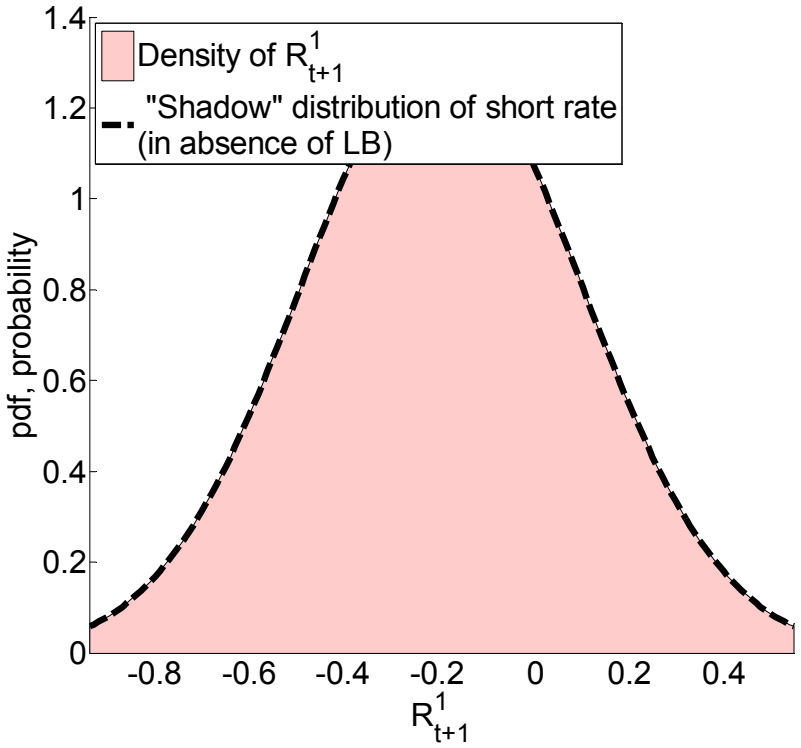
(percent p.a.)



Sources: ECB calculations.
Notes: Yield decomposition into expectational component and term premium, with 'risk aversion' parameter γ=2.and Q=1. Term premium vanishes as under the assumed forward guidance, the variance is zero.

Option 2: NIRP with no forward guidance on R^1_{t+1} ...

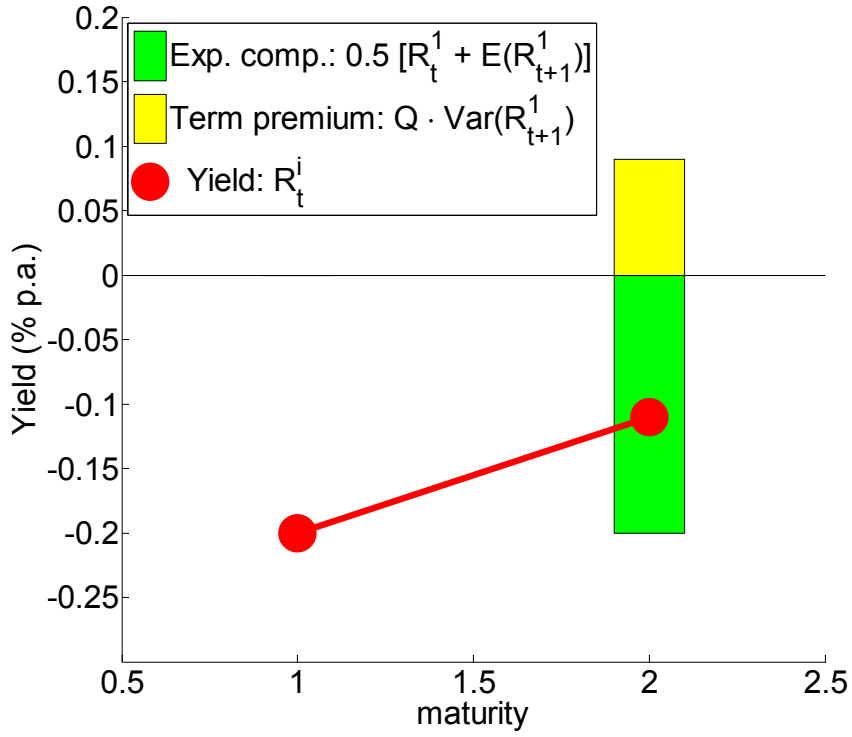
Distribution of short-term rate R next period



Sources: ECB calculations.
Notes: Hypothetical and illustrative example with current short rate S_t equal to -0.2%, β = 1.2 and σ^2_π = 0.25, and lower bound removed. Hence actual current and expected short rate $R^1_t = E(R^1_{t+1})$=-0.2%. The variance is now maximal. i.e. equal to the variance of the shadow rate distribution.

Term structure of interest rates

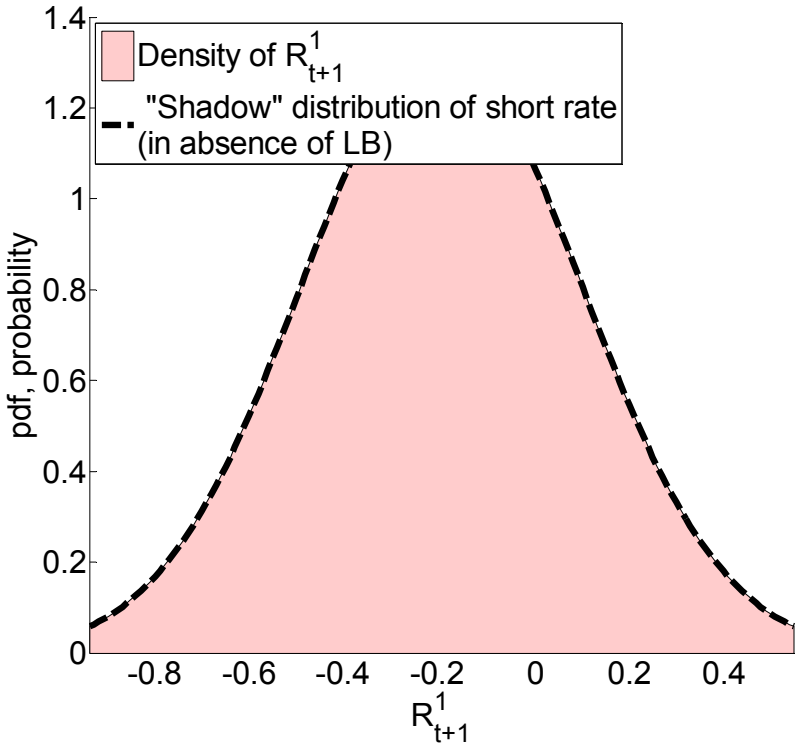
(percent p.a.)



Sources: ECB calculations.
Notes: Yield decomposition into expectational component and term premium, with 'risk aversion' parameter γ=2 and Q=1. Compared to status quo, yield drops from 3 to -11 bps. Expectational component drops from 2 to -20 bps. Term premium is higher than under 'status quo' (9 vs 1 bps) as the variance is higher.

… possibly reinforced by QE to compress term premium

Distribution of short-term rate R next period



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Term structure of interest rates

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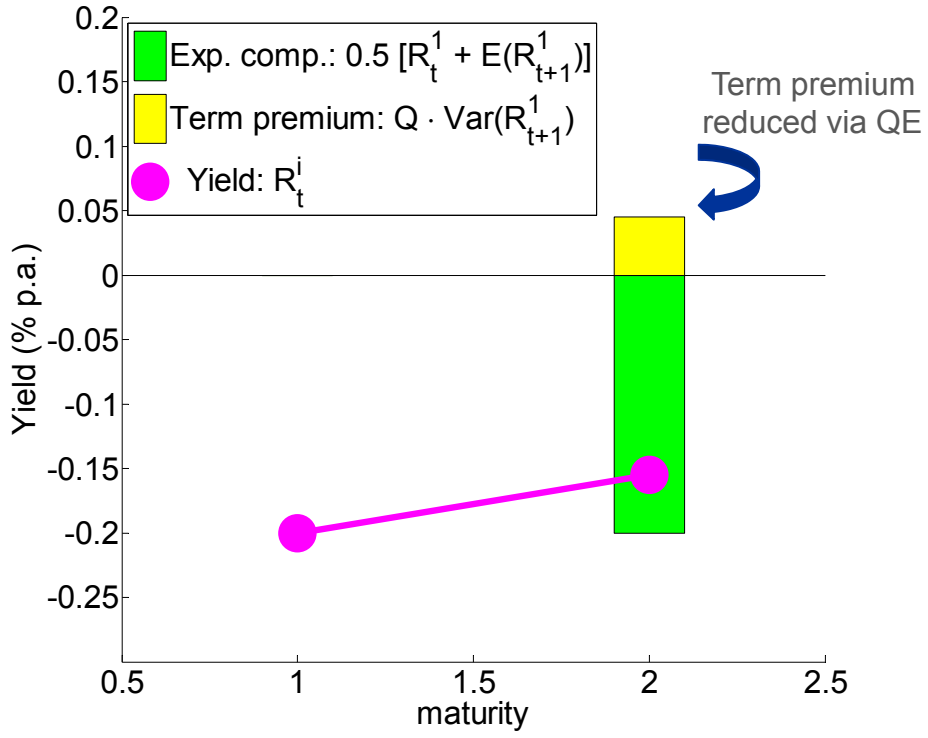

Sources: ECB calculations.
Notes: Yield decomposition into expectational component and term premium, with 'risk aversion' parameter γ=2 and Q=0.5, i.e. reducing private sector bond holdings by one half. Compared to status quo, yield drops from 3 to -16 bps. Expectational component drops from 2 to -20 bps. QE reduces term premium further to below 5 bps.

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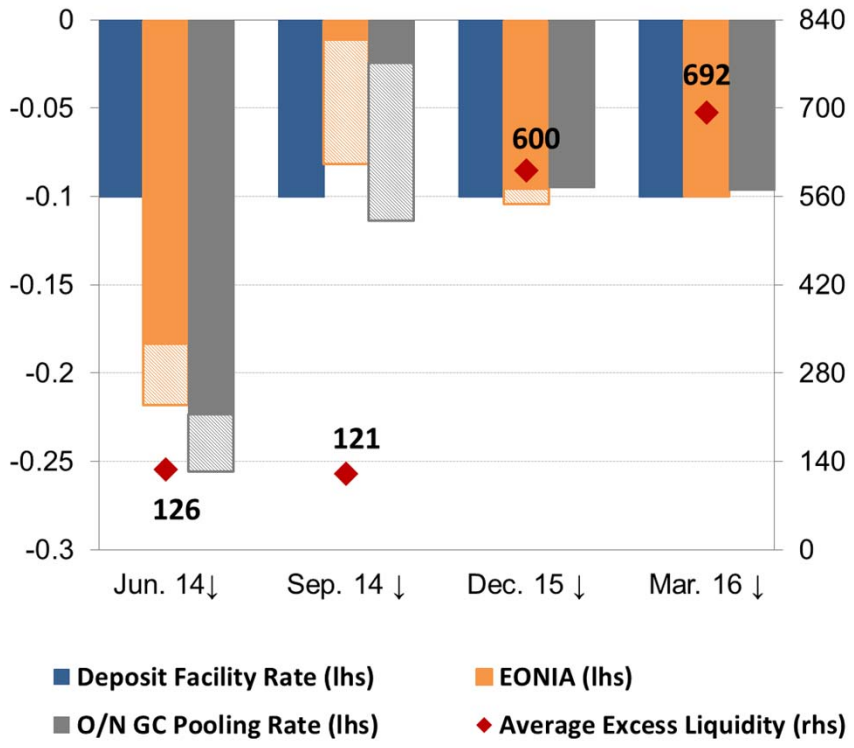
Transmission: smooth pass-through with ample liquidity

Change in deposit rate and money market rates and excess liquidity

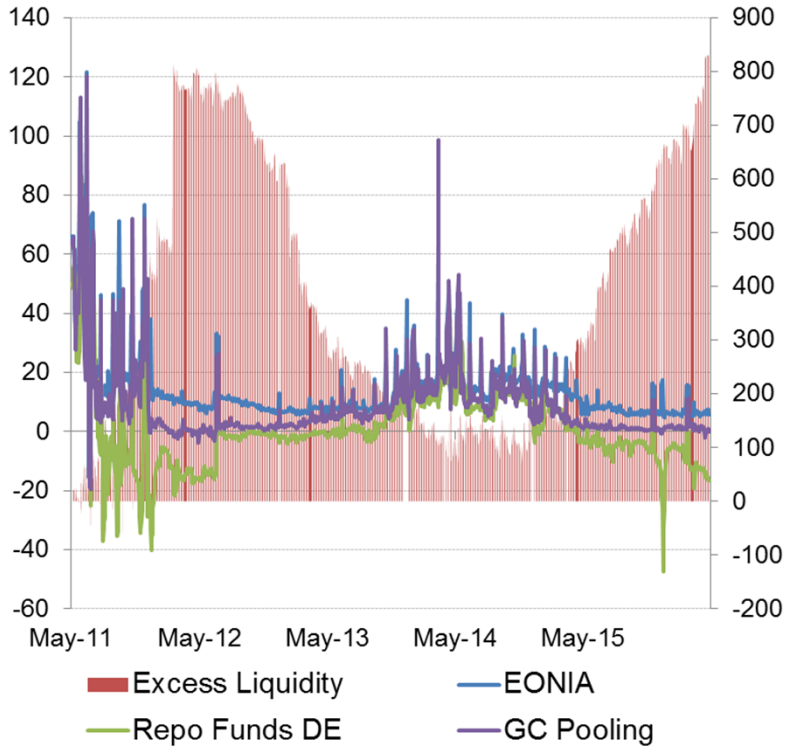
(average rate in the maintenance period (MP) after the rate cut (solid) and as of second MP until next rate change (stripes), in % (lhs) and billion euro (rhs))



Sources: ECB, EMMI, Eurex repo and Bloomberg .

Spreads of money market rates with deposit rates and excess liquidity

(basis points (lhs) and billion euro (rhs))

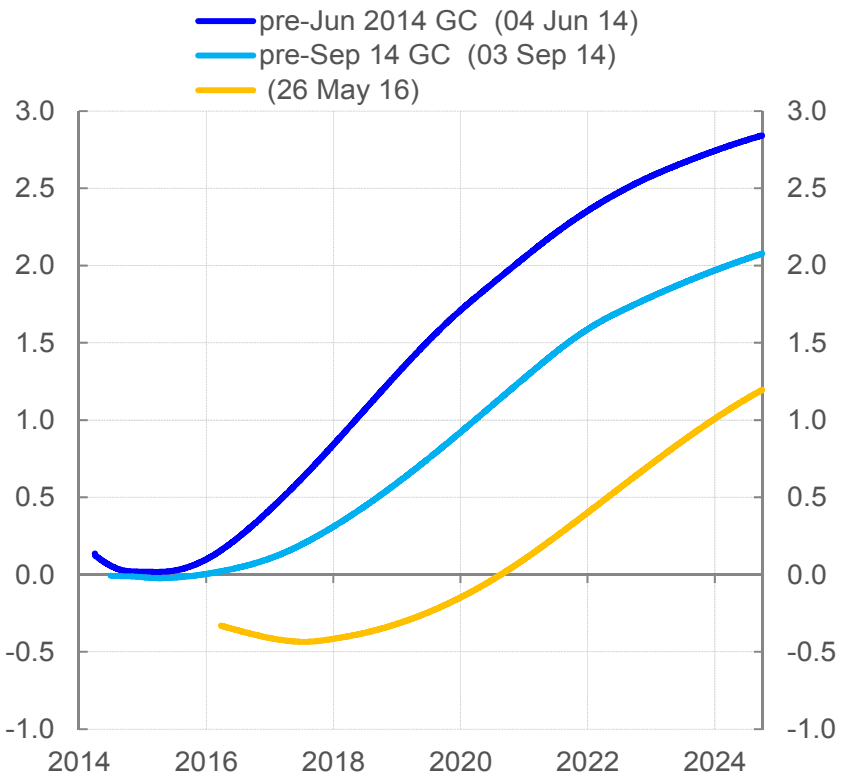


Sources: ECB, EMMI, BrokerTec , Eurex repo and Bloomberg, .

Transmission: the risk-free yield curve

EONIA Forward Curves since June 2014

(percentage points)



Sources: ECB and Reuters
Note: Curve shows instantaneous EONIA forward rates based on OIS.

A *calamitous misadventure*?

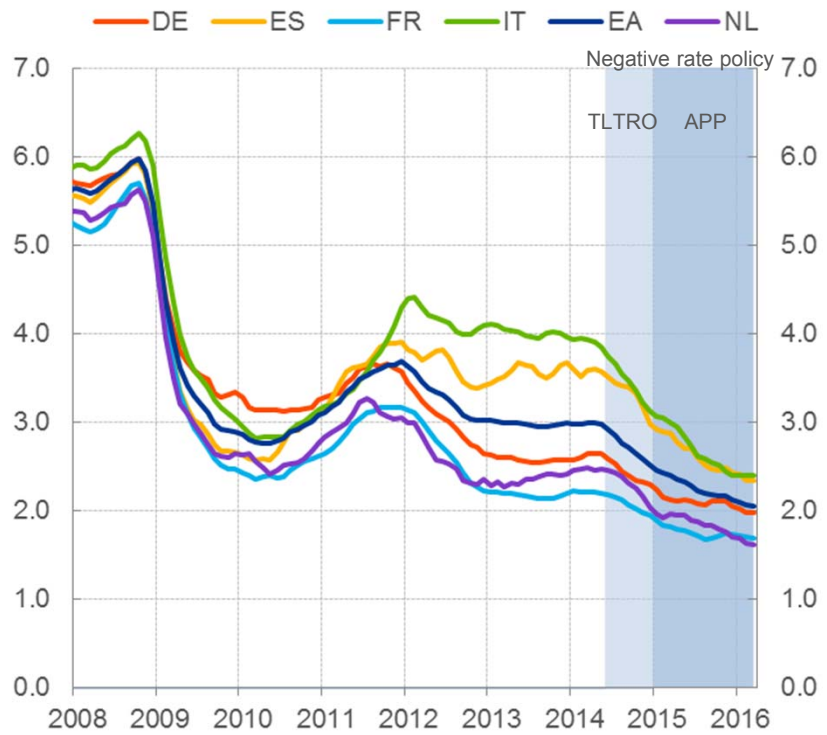
Why a negative interest rate policy

- **Removes non-negativity restriction on future *expected short rates*:** forward curve becomes flatter than it would be if short rates were expected to be constrained by a zero lower bound
- **Charges bank cash hoarding**: extra downward pressure on long-term rates via ***term premium compression*** and push to ***portfolio shifts***
- **NIRP has flattened and stabilized the** term **structure** since 2014

Transmission: The bank lending channel

Bank lending rates on loans for companies

(percentages per annum; three-month moving averages)



Source: ECB.
Notes: The indicator for the total cost of lending is calculated by aggregating short- and long-term rates using a 24-month moving average of new business volumes. Latest observation: March 2016.

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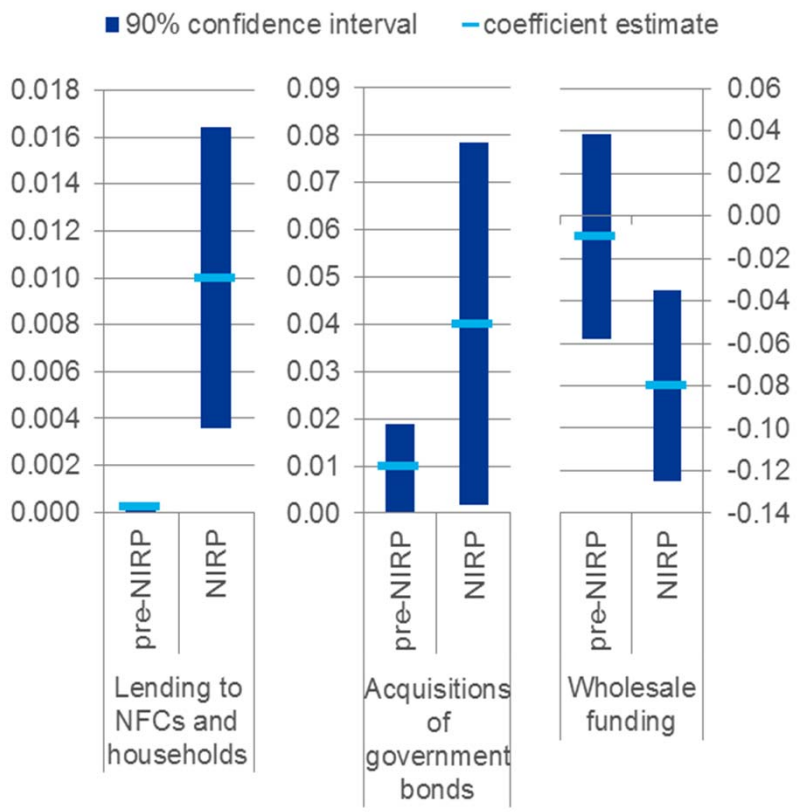
- **NIRP has compressed levels and dispersion of banks' lending rates** across euro area …

Transmission: The bank lending channel

Bank reactions to holdings of excess liquidity
(coefficient estimates)



Sources: ECB estimates based on S. Demiralp, J. Eisenschmidt and T. Vlassopoulos, (2016), "The impact of negative interest rates on bank balance sheets: Evidence from the euro area", ECB mimeo.
Note: estimates refer to less vulnerable euro area countries (Belgium, Germany, Estonia, France, Latvia, Luxembourg, Malta, the Netherlands, Austria, Slovakia and Finland)

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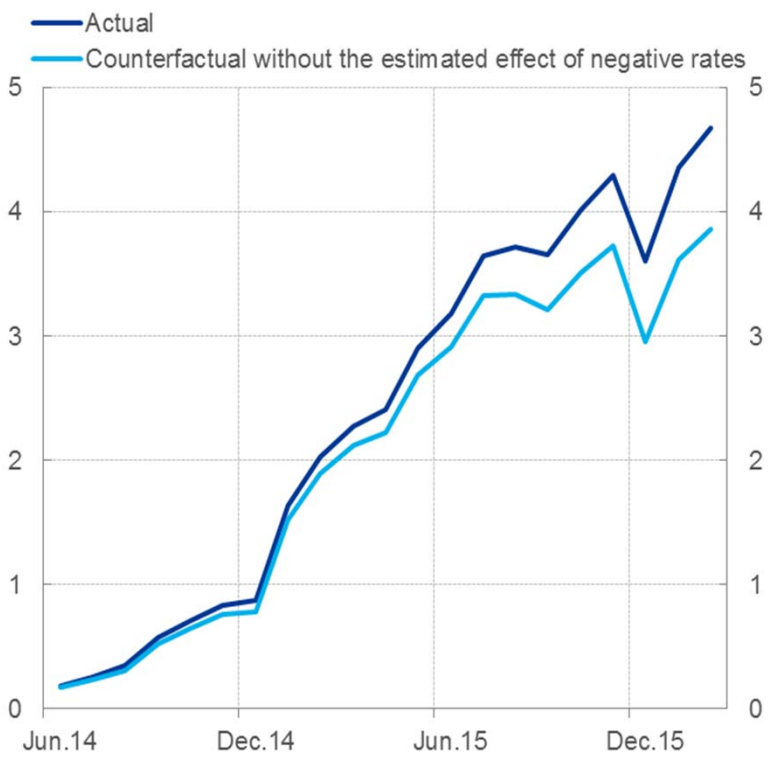
- **… as the charge on excess liquidity shifts the risk-reward** calculus of bank s' portfolio allocation

Transmission: The bank lending channel

Cumulated changes in loans to companies

(percentage changes)



Sources: ECB estimates based on S. Demiralp, J. Eisenschmidt and T. Vlassopoulos, (2016), "The impact of negative interest rates on bank balance sheets: Evidence from the euro area", ECB mimeo.
Note: The chart refers to the sample of banks for which individual bank data is available. Less vulnerable euro area countries are Belgium, Germany, Estonia, France, Latvia, Luxembourg, Malta, the Netherlands, Austria, Slovakia and Finland.

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- … and makes **loans more attractive**

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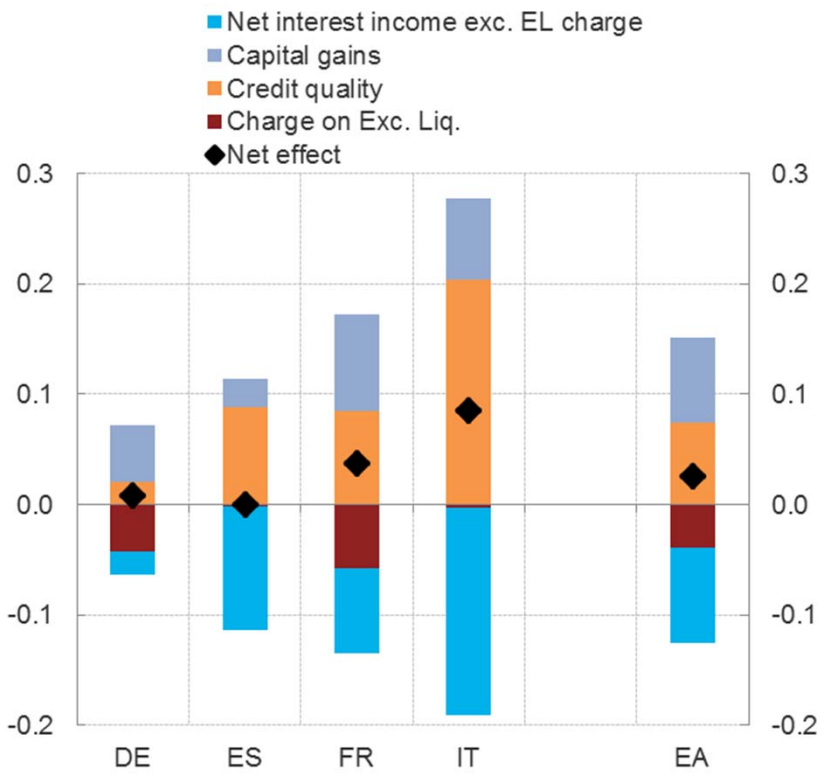
E	Outlook and open issues

Financial stability: A tax on bank intermediation?

Bank profitability and monetary policy: 2014-2017

(contribution to ROA, percentage points)



Source: EBA, ECB and ECB estimates.
Notes: Deviation from no policy action scenario. Capital gains based on data on a consolidated basis for 68 euro area banking groups under direct ECB supervision and included in the 2014 EU-wide stress test. Euro area figures calculated as the weighted average for the countries included in the sample using Consolidated Banking Data (CBD) information on the weight of each country's banking system on the euro area aggregate. Effect on net interest income based on aggregate BSI data and obtained by simulation of the interest income and interest expenses based on estimates of the effect of APP on bond yields, lending and deposit rates, excess liquidity and economic growth taking into account BMPE projections for interest rates and credit aggregates. Effect on credit quality based on the median of estimates obtained from a suite of empirical studies.

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- … and makes **loans more attractive**

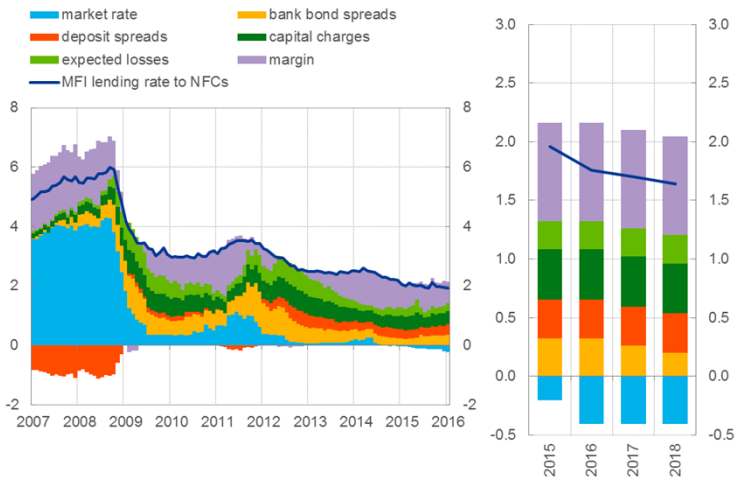
Multiple channels

- **Charge on bank cash is a tax** on *core banks*
- **Falling Euribor pressures margins** in *periphery*
- **But there are several offsetting factors …**
- **… and net impact is muted** over next few years

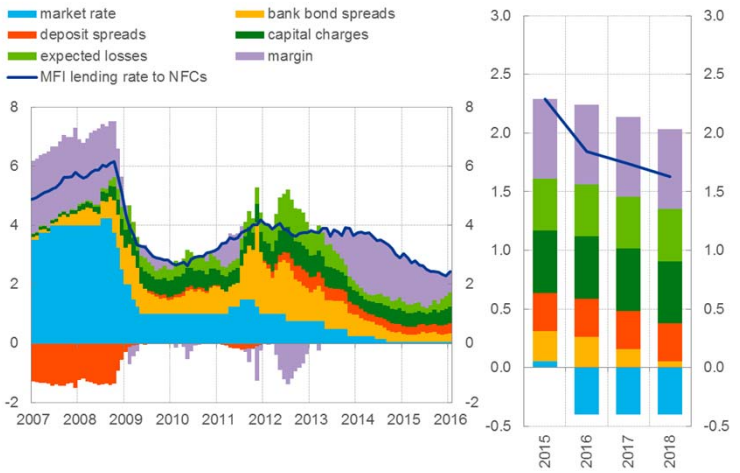
Financial stability: The TLTRO safeguard

Banks' lending costs and lending margins
(annual percent change)

Germany and France



Italy and Spain



Sources: ECB calculations.

ECB Constrained optimisation

- ***Preserve downward pressure on borrowing costs***
- ***But avoid that a tax on banks' cash hoarding turn into a tax on bank intermediation***

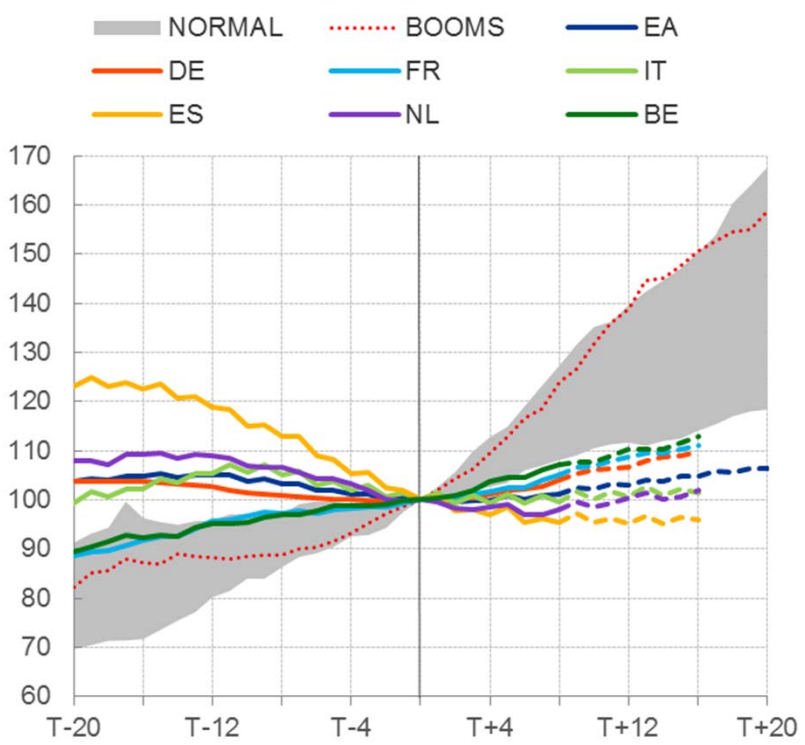
TLTRO-2

- **Announce series of 4-year lending operations** with reward for banks outperforming lending benchmark
- The TLTRO reward calibrated so as to **give banks some room for recovering lending margins** (purple bars on the left) **while keeping lending rates on a declining trend**
- In practice: **index ex post TLTRO-2 borrowing rate for outperformers to deposit facility rate …**
- **… and thereby pull down the base rate** (light blue bars on the left) **off which banks price loans**

Financial stability: No property price bubble in sight

Real household loans around starting period of house price booms

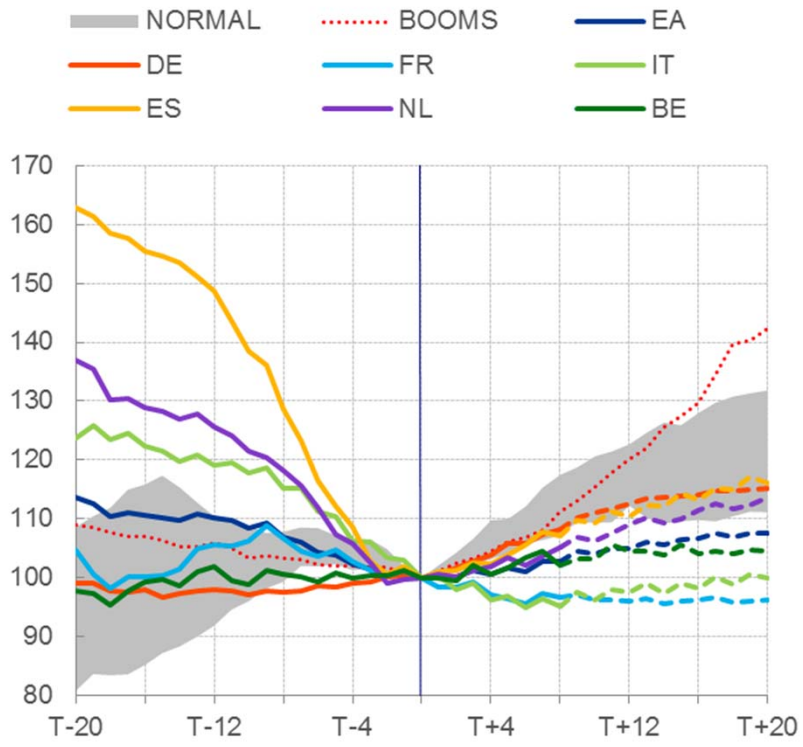
(indices, normalised to 100 at T=trough; T=2013Q4)



Sources: BIS, ECB and ECB calculations.
Notes: Based on data from 1970Q1 to 2015Q4 for euro area countries. All indicators are deflated by HICP. Projections for euro area are June 2016 BMPE Projections while for countries are December 2015 BMPE projections. Trough (starting point of house price normal increases or booms) identified via quarterly version of Bry-Boschan algorithm by Harding and Pagan, 2002. Dotted line refers to median during house price booms. Grey range refers to interquartile range during normal house price increases.

Real house prices around starting period of house price booms

(indices, normalised to 100 at T=trough; T=2013Q4)

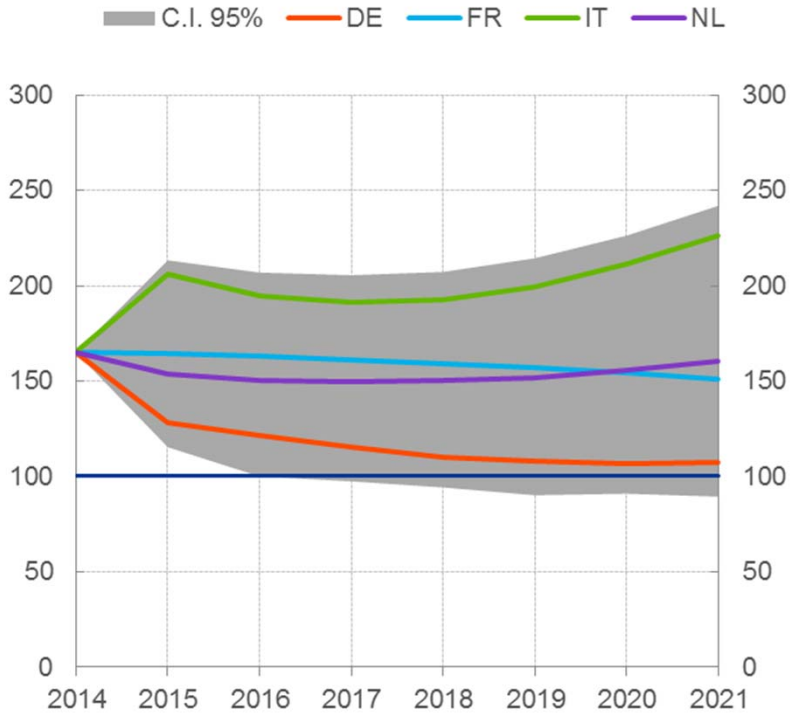


Sources: BIS, ECB , Fed Dallas, OECD and ECB calculations.
Notes: Based on data from 1975Q1 to 2015Q4 for euro area countries. All indicators are deflated by HICP. Projections for euro area are June 2016 BMPE projections. Trough (starting point of house price normal increases or booms) identified via quarterly version of Bry-Boschan algorithm by Harding and Pagan, 2002. Dotted line refers to median during house price booms. Grey range refers to interquartile range during normal house price increases.

Financial stability: Insurance industry slowly adapting

Projection of solvency ratios under the "adverse" scenario

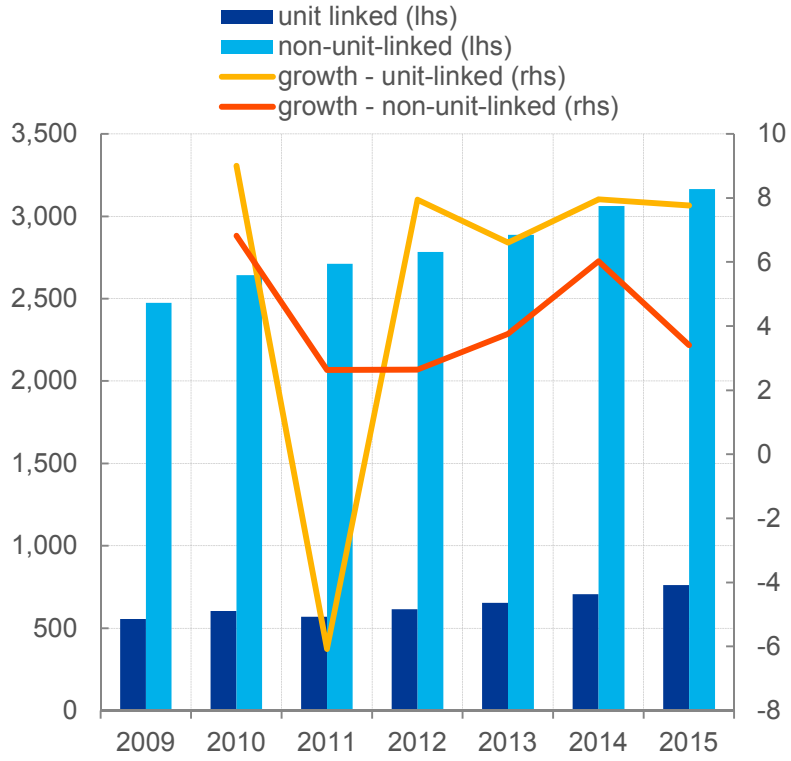
(2014-2021; SCR ratio)



Source: ECB-DGMF/FSS calculations.
Note: The solid lines represent the median solvency ratios defined as Own Funds over Solvency Capital Requirements. C.I. is the confidence interval containing the 95% of the simulated solvency ratios for the considered countries.

Net equity of households in unit-linked and non-unit-linked life insurance

(2009-2015;EUR billions; percentages)

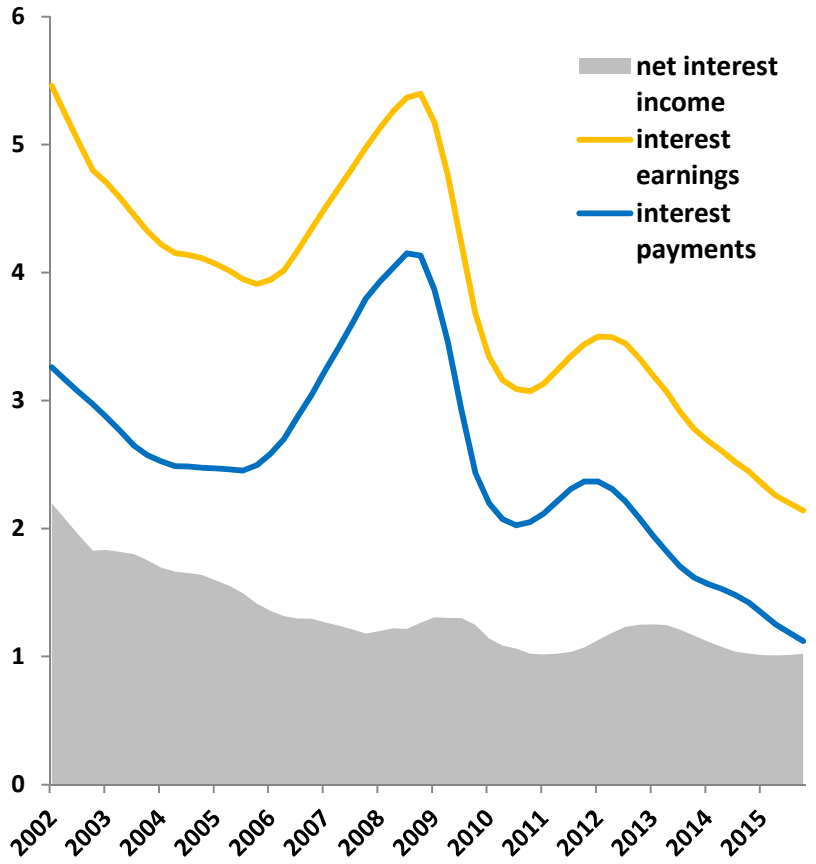


Source: ECB.

Financial stability: No expropriation of savers in aggregate

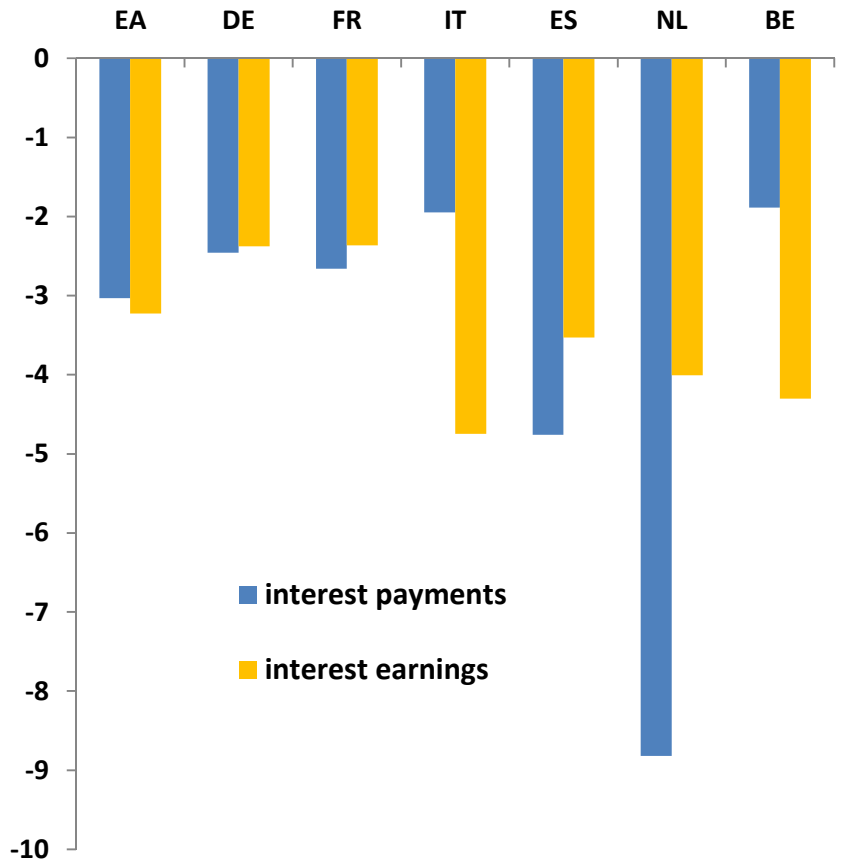
Euro area household interest payments/earnings

(as a share of disposable income)



Change in household interest payments/earnings since 2008Q3

(as a share of disposable income, percentage points)



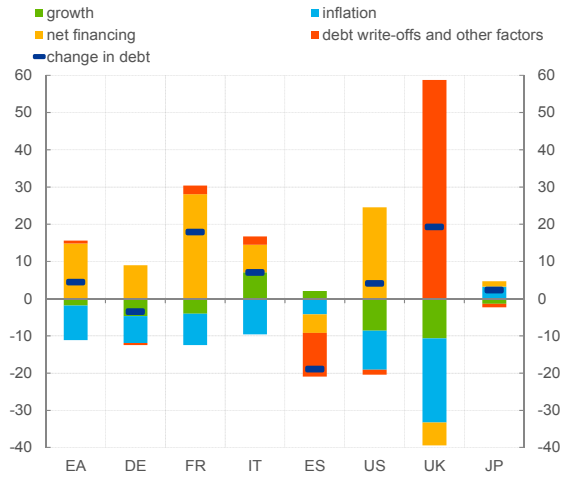
Sources: Eurostat and ECB calculations.
Note: The change has been computed for the period 2008Q3-2015Q4. Interest payments/earnings after FISIM allocation (Financial Intermediation Services Indirectly Measured).
Latest observation: 2015Q4

Financial stability: Policy helps deleveraging

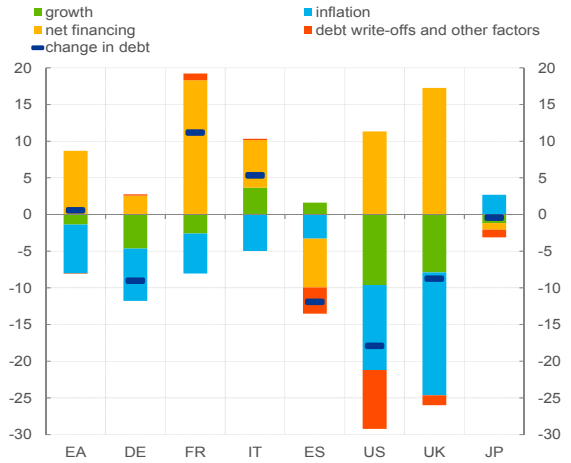
Change in private debt since mid-2007

(as a percent of nominal GDP; percentage point contributions)

NFCs

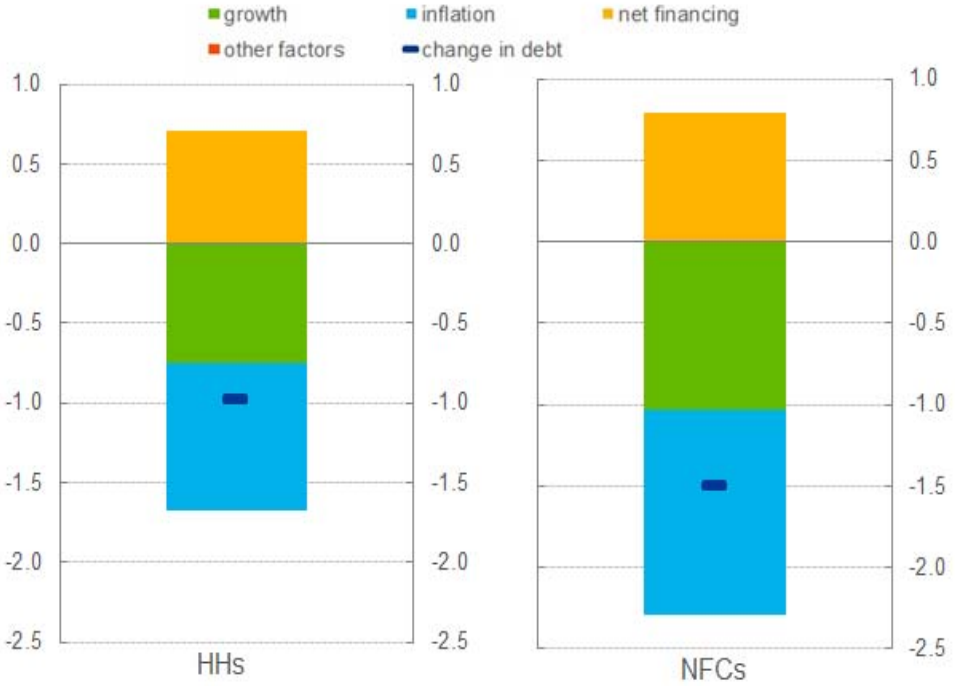


HHs



The estimated cumulative impact of ECB measures on the euro area private debt in 2015-18

(percentage points)



Sources: Eurostat, ECB, Fed, ONS, Bank of Japan, ECB calculations.

Notes: Corporate debt is defined as the sum of total loans granted to NFCs net of inter-company loans, debt securities issued and pension liabilities. Household debt includes total loans granted to households. Other factors include possible valuation effects and reclassifications. Latest observation: 2015 Q4 for EA, US and JP and 2015 Q3 for DE, FR, IT, ES and UK. The impact of APP on NFCs and HHs debt (RHS) excludes the March 2016 package.

Overview

A Why? NIRP rehabilitates monetary policy in a low rate world

B A simple model exercise: NIRP versus ZLB plus forward guidance

C Transmission

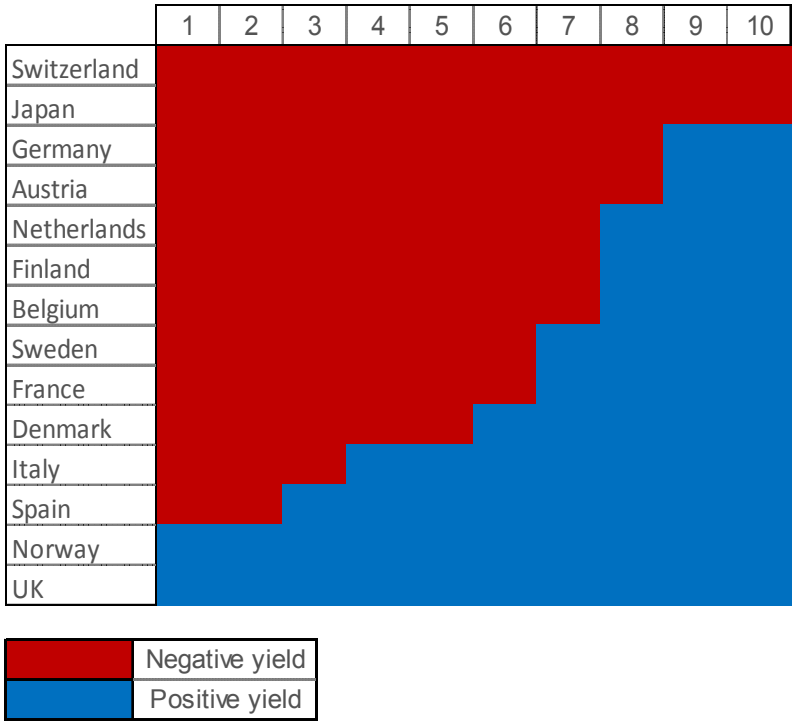
D Financial stability

E Outlook and open issues

Outlook and open issues

Share of government bonds with negative rates

(as a percent of nominal GDP; percentage point contributions)



Source: Deutsche Bank and ECB calculations
Note: Maturities are shown on the horizontal axis. For NL, SE, FR and IT the 1 year maturity refers to T-Bills. The last observation available for NL 1y T-Bill is 18/01/2015 and for SE is 20/01/2016. The last observation for 2y Government Bond for the NL is 18/02/2016. The last observation available for the 3y Government Bond for DK is 12/01/2016 and for SE is 05/02/2015. The last observation available for the 4y Government Bond for DK is 01/2/2013 and for the NL is 18/02/2016. The last observation available for the 6y Government Bond for DK is 22/10/2015 and for the NL is the 18/02/2016. No observations are available for 6, 8 and 9 years maturity for SE; for 1, 7, 8 and 9 years for DK, and 9 years maturity for the UK. The maturity without observation obtains the same colour as of one maturity below and above, in case these have the same colour or the colour following to the yield curve. Latest observation is 26 May 2016.

A *calamitous misadventure*?

- **No. NIRP is a symptom**: incidence of negative rates attests to the **global nature of the phenomenon**
- **Safe assets have been decimated** during the crisis (especially in Europe), their price has surged
- **Two ways to curb excess demand for safety**: Let incomes fall or make safe assets very expensive
- **NIRP** is an **efficient way to accomplish the latter**
- ***In the short term*, NIRP re-empowers monetary policy,** conventional and unconventional
- ***But, if reflation is retarded*, transmission could change** in unknown directions**:**
  - **Protracted period of low rates is fertile ground for asset price bubbles**
  - **Bank disintermediation could proceed faster**
  - **Insurers could become asset managers**
  - **Savers could feel more exposed to risk than desired, and de-risk more aggressively**
- **Fast return of inflation to objective is key** to avoiding these risks

Thank you