



Monetary policy at the Riksbank

KTH (2017-11-15)

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

What do we do at Riksbank

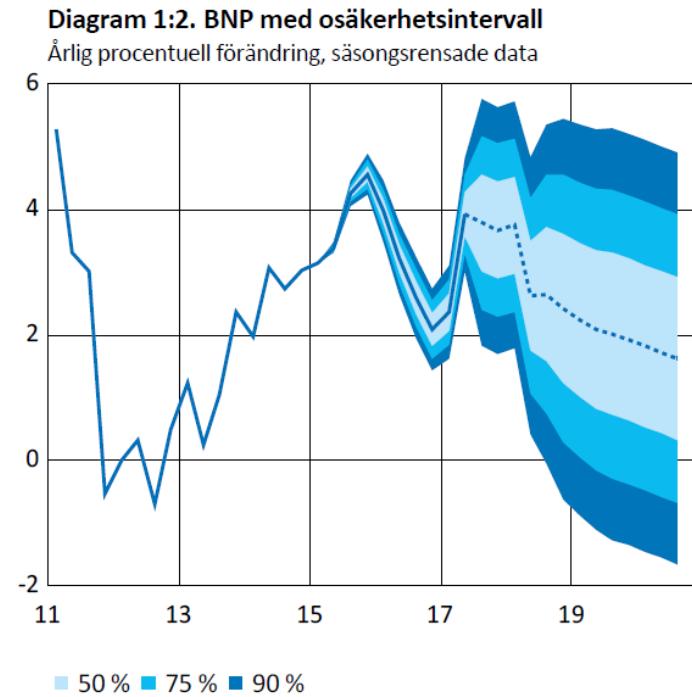
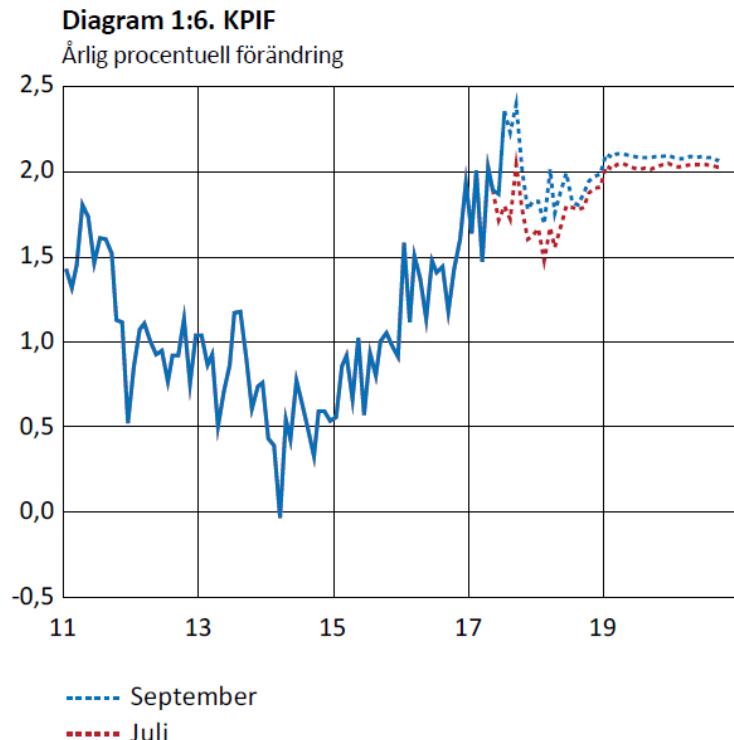
- Riksbank's mandate according to "Sveriges Riksbank Act" is :
 - To maintain price stability (inflation target 2%).
 - To support economic policy with the view of achieving sustainable growth and high employment
 - To promote a safe and efficient payment system
- Advantages of targeting inflation:
 - Stable inflation is thought to imply stable economy
 - We have a good measure that is reliable and not revised subsequently

Why do we need forecasts at Riksbank

- Target the inflation by:
 - Moving the repo rate
 - Purchasing government bonds
- Channel:
 - Lower interest rates -> save less, consume and invest more – > higher prices
- Monetary policy works with a lag, need to know what inflation (and other related data) is expected to be in 1-3 years time

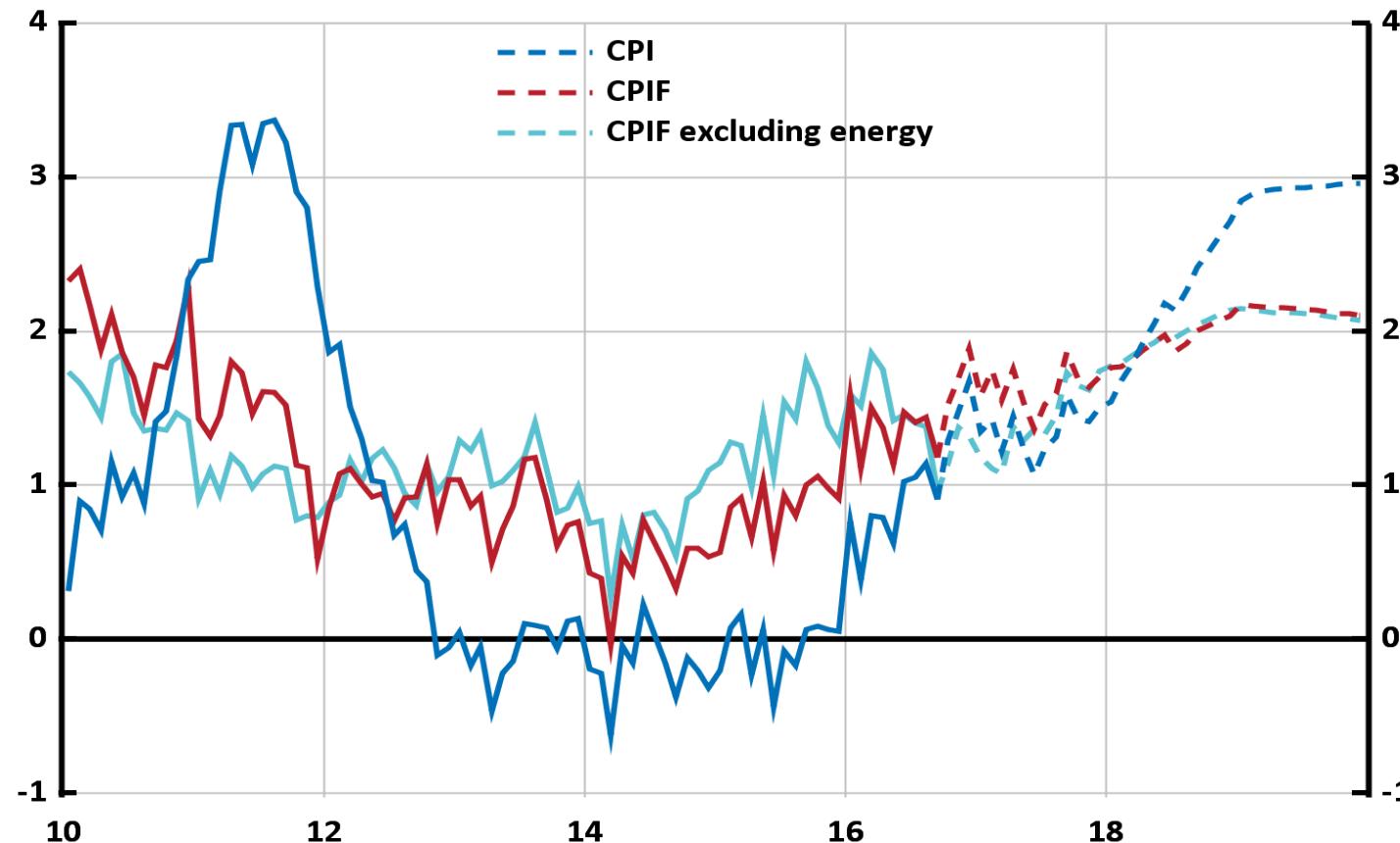
Riksbanks' forecast

Monetary policy report September 2017



Inflation has been too low for several years

Annual percentage change

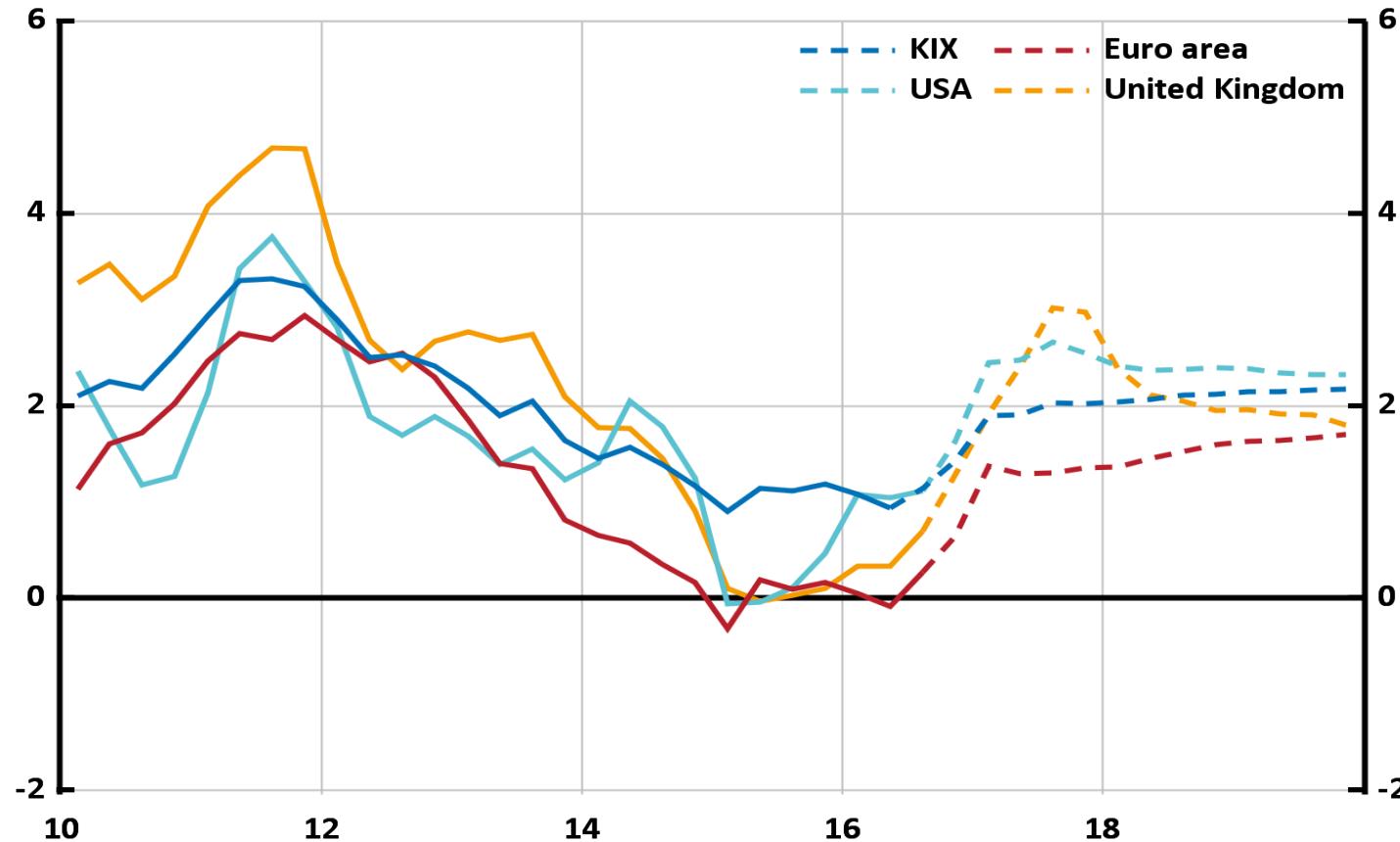


Note. The CPIF is the CPI with a fixed mortgage rate.

Sources: Statistics Sweden and the Riksbank

...Also abroad

Annual percentage change



Note. KIX is an aggregate of the countries that are important to Sweden's international transactions. When calculating KIX-weighted inflation, the HICP is used for the euro area and the CPI for other countries. Inflation for the euro area is shown measured using the HICP and for the United States and the United Kingdom measured using the CPI.

Sources: The Bureau of Labor Statistics, Eurostat, national sources, Office for National Statistics and the Riksbank



What is inflation

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Inflation is an increase in the overall price level

- In Sweden, the independent statistical agency, SCB computes the inflation in Sweden
 - In practice: set up a basket of goods typically consumed by people in Sweden. Collect the prices of those goods and weight them by their importance in the basket. Get a price level index.
 - Compute inflation rate by taking the growth of the index.
 - CPI, CPIF, CPIFxe



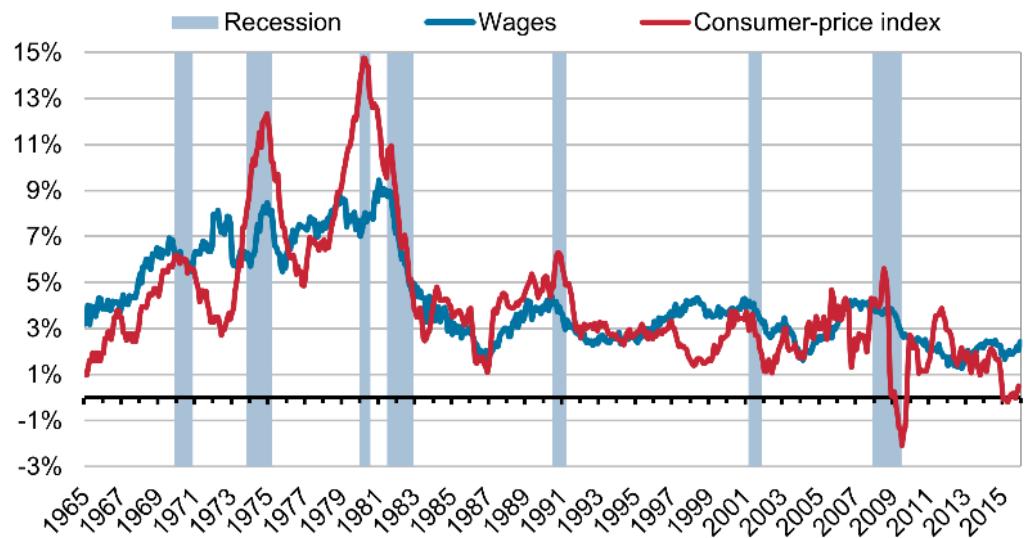
Inflation is about goods and services prices increasing

- Wages grow at around the same rate, so that purchasing power is not changing.



Wage Growth and Inflation

Annual change in average hourly earnings of production and nonsupervisory workers and annual change in the consumer-price index



Source: Labor Department | WSJ.com

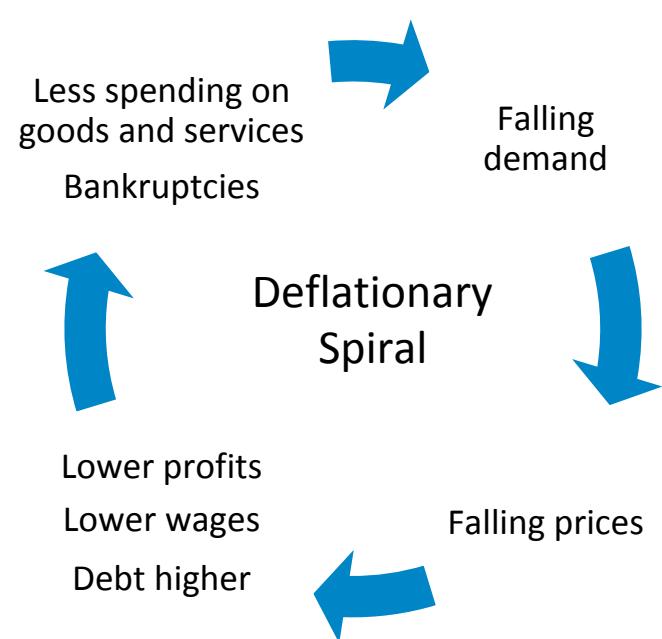
Costs of too high inflation

- Costs of too high inflation
 - Uncertainty about future price level
 - Inflation expectations should be anchored to keep inflation stable
 - Relative price distortions
 - Hard to say whether prices of goods moved relative to others or due to overall increase in price level
 - Nominal tax brackets
 - "Shoe-leather" costs



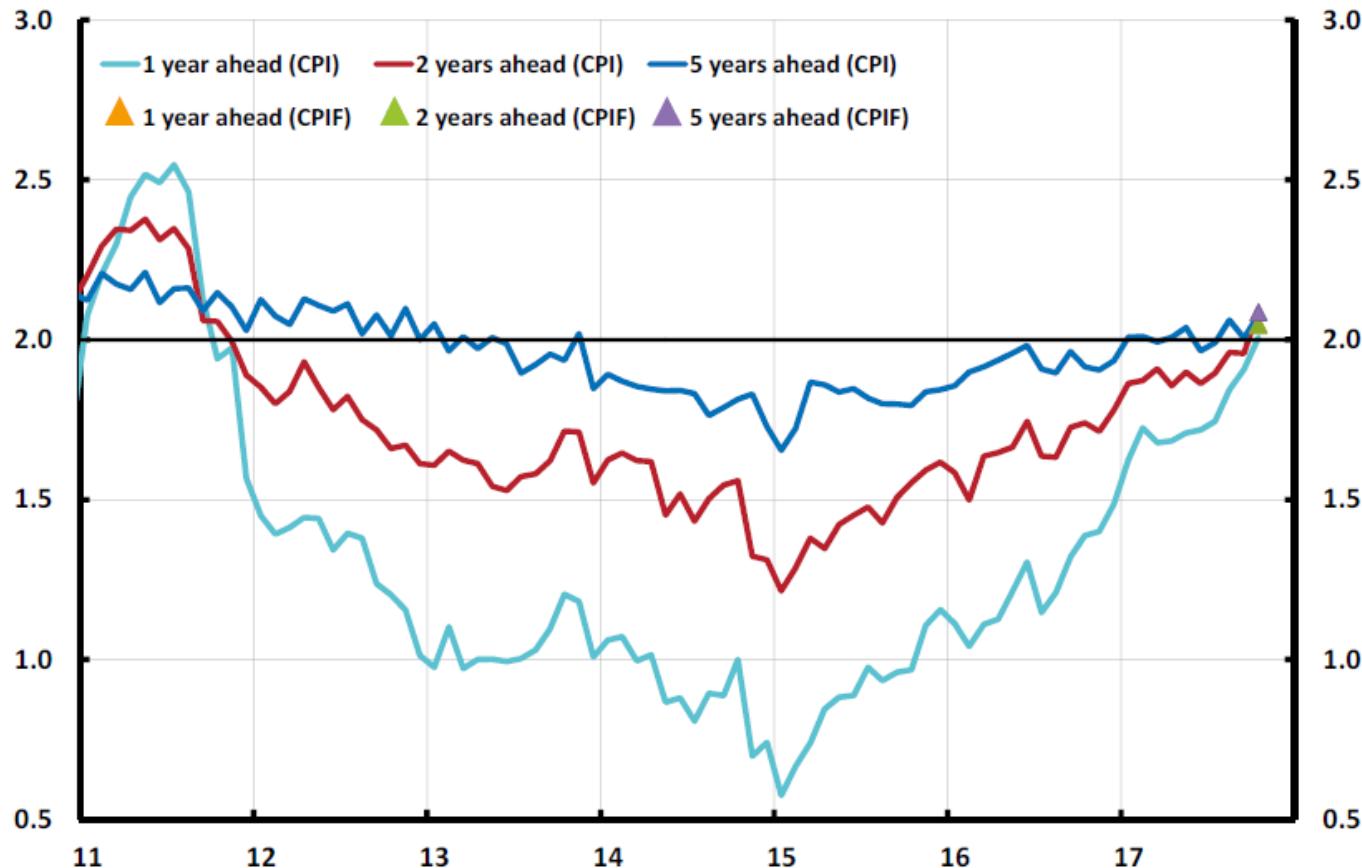
Costs of too low inflation

- Costs of too low inflation
 - Uncertainty about future price level
 - Nominal wages rigid downwards
 - Lower bound on nominal interest rates
 - Nominal debt contracts
 - Deflation may lead to recession



Inflation expectations have been falling, not anchored

Per cent, mean value



Source: TNS Sifo Prospera

Forecasting inflation at Riksbank

- Target the inflation by:
 - Moving the repo rate
 - Purchasing government bonds
- Channel:
 - Lower interest rates -> save less, consume and invest more –> higher prices
- Monetary policy works with a lag, need to know what inflation (and other related data) is expected to be in 1-3 years time



How to control inflation

100

100

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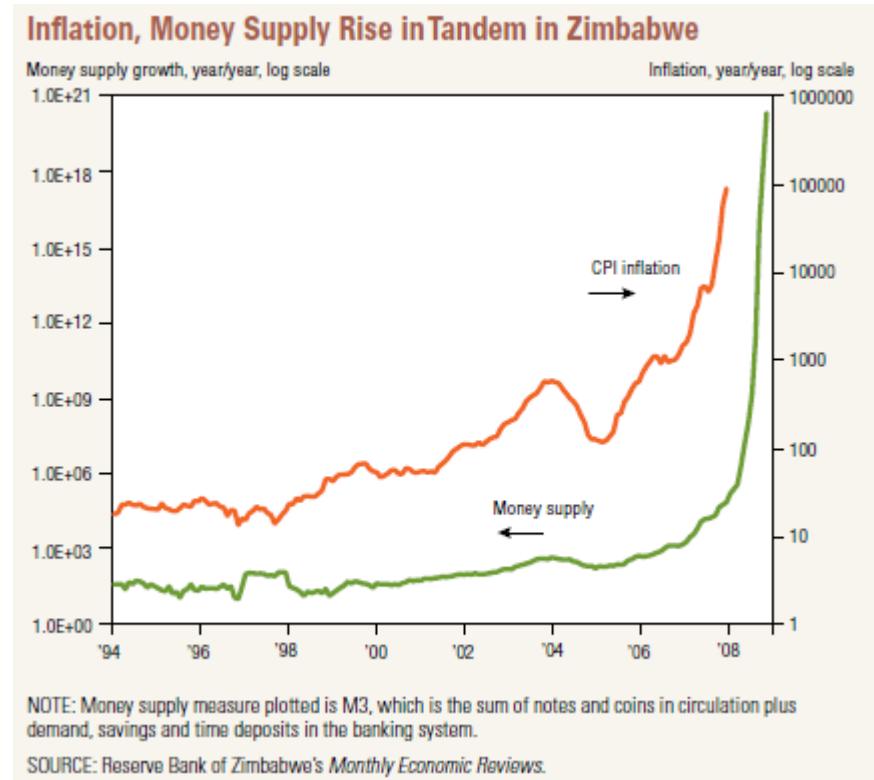
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Money and inflation

- Quantity theory of money:
 - Money * velocity = price * output(transactions)
 - Velocity is fairly constant over time
 - Output determined by productive capacity
 - **Money -> prices**

“Inflation is always and everywhere a monetary phenomenon”

Milton Friedman



What is money

- **Functions of money**

- Store of value
 - Buy a house in a year, store money until then
- Unit of account
 - Terms in which prices and debts are recorded
- Medium of exchange
 - No need for “double coincidence of wants”

- **Measuring money**

- MB = Notes and coins, bank reserves at the central bank
- M1 = MB plus deposits
- M2 = M1 plus mutual fund balances, saving deposits, small time deposits
- M3 = M2 plus large time deposits, repurchase agreements, other large liquid assets

Central banks control money supply in order to control inflation

- Central banks have a monopoly over “printing” money - monetary policy
- In reality, it does not print money, it steers the interest rates in the economy (OMOs, overnight interest rate)
- Debate in the 90s on money supply vs. interest rate
 - Bernanke, Blinder (1992 AER), Sims (EER 1992),

TABLE 1—MARGINAL SIGNIFICANCE LEVELS OF MONETARY INDICATORS FOR FORECASTING ALTERNATIVE MEASURES OF ECONOMIC ACTIVITY: SIX-VARIABLE PREDICTION EQUATIONS

Forecasted variable	M1	M2	BILL	BOND	FUNDS
<i>A. Sample Period 1959:7–1989:12:</i>					
Industrial production	0.92	0.10	0.071	0.26	0.017
Capacity utilization	0.74	0.22	0.16	0.40	0.031
Employment	0.45	0.27	0.0040	0.085	0.0004
Unemployment rate	0.96	0.37	0.0005	0.024	0.0001
Housing starts	0.50	0.32	0.52	0.014	0.22
Personal income	0.38	0.24	0.35	0.59	0.049
Retail sales	0.64	0.036	0.33	0.74	0.014
Consumption	0.96	0.11	0.12	0.46	0.0052
Durable-goods orders	0.87	0.22	0.28	0.19	0.039

Taylor rule to choose the interest rate the central bank should set

- Taylor rule to set the nominal interest rate:

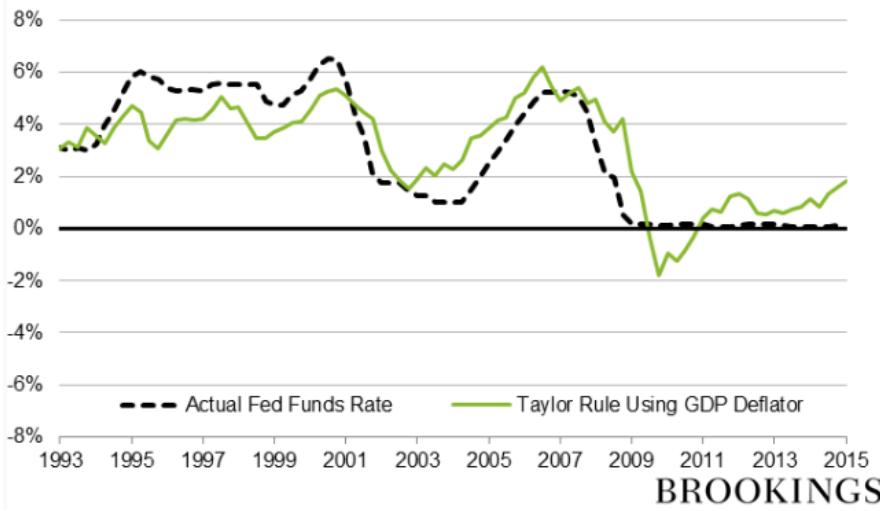
$$i_{\downarrow t} = \pi_{\downarrow t} + r_{\downarrow t \uparrow *} + \alpha_{\downarrow \pi} (\pi_{\downarrow t} - \pi_{\downarrow t \uparrow *}) + \alpha_{\downarrow y} (y_{\downarrow t} - y_{\downarrow t})$$

- Inflation, eq'm real interest rate, deviation of inflation from target, deviation of output from its potential level
- John B. Taylor proposed that $\alpha_{\downarrow \pi} = \alpha_{\downarrow y} = 0.5$

John B. Taylor's criticism

- In 2003-2005, monetary policy was too loose, and a major source of the housing bubble and other financial excesses
- Fed should have increased the rates much earlier after the crisis

Figure 1: The Original Taylor Rule, 1993-Present



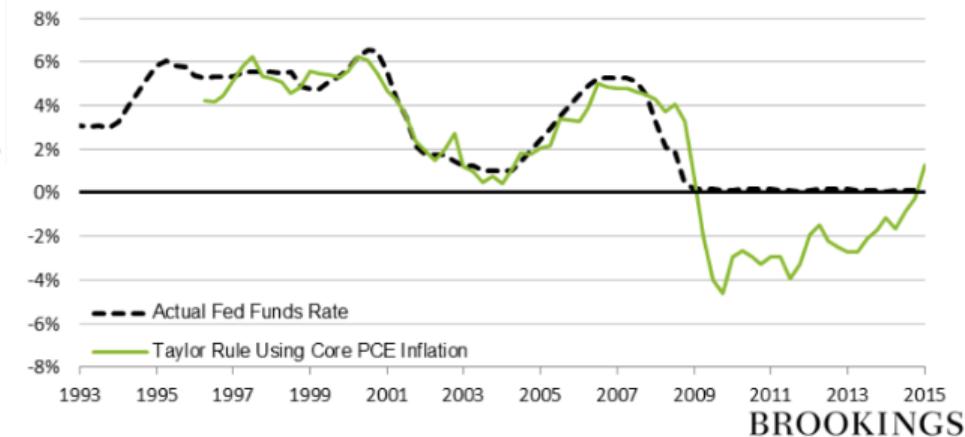
Ben Bernanke:

<https://www.brookings.edu/blog/ben-bernanke/2015/04/28/the-taylor-rule-a-benchmark-for-monetary-policy/>

Bernanke's update, use core inflation and weight of 1 on output gap

Figure 2: Predictions of a Modified Taylor Rule

(Core PCE inflation, weight of 1.0 on output gap)



Prices do not change frequently, monetary policy can affect GDP

- In reality, prices are sticky in the short-run (menu costs)
 - Money supply can affect the GDP in the short-run
 - In the long-run, money supply affects only nominal variables (prices)



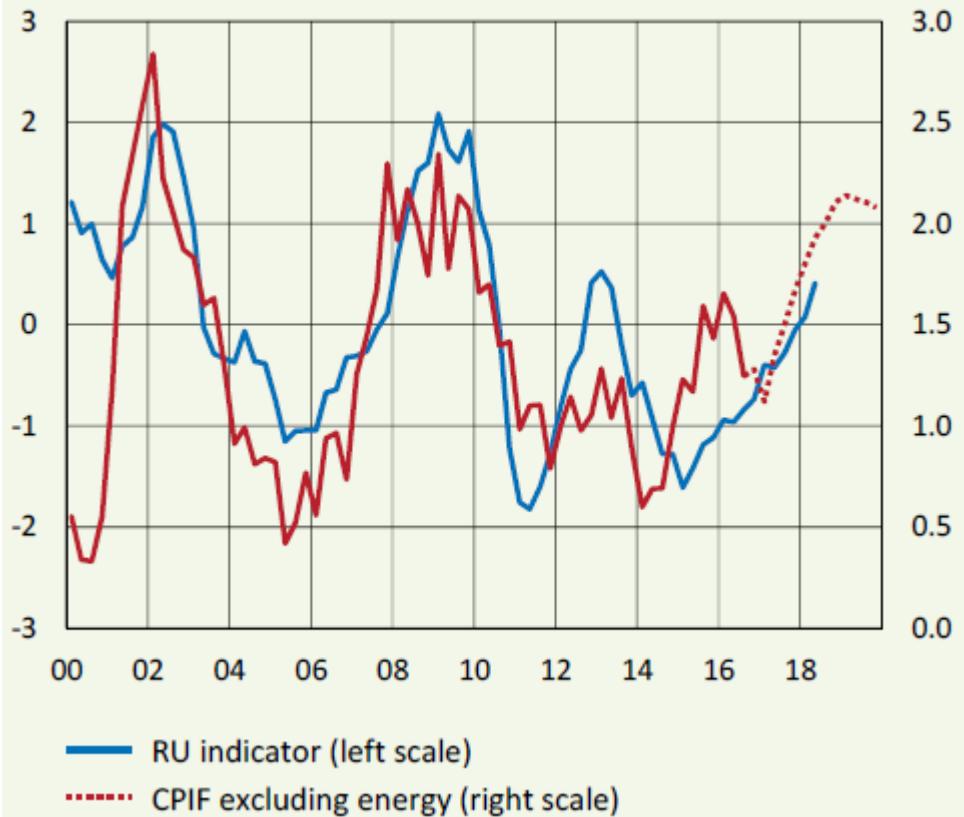
The Phillips curve

- High money supply
 - Low unemployment
 - High inflation

$$\pi_{\downarrow t} = \pi_{\downarrow t}^{\uparrow e} - \beta_{\downarrow 1} (u_{\downarrow t} - u_{\downarrow t}^{\uparrow *}) + \varepsilon_{\downarrow t}$$

- Trade-off:
 - Tolerate periods of high inflation in order to get GDP up (unemployment back to normal)

Figure 4:22. CPIF excluding energy and the RU indicator
 Standard deviation and annual percentage change respectively



Monetary policy aims at low and stable inflation

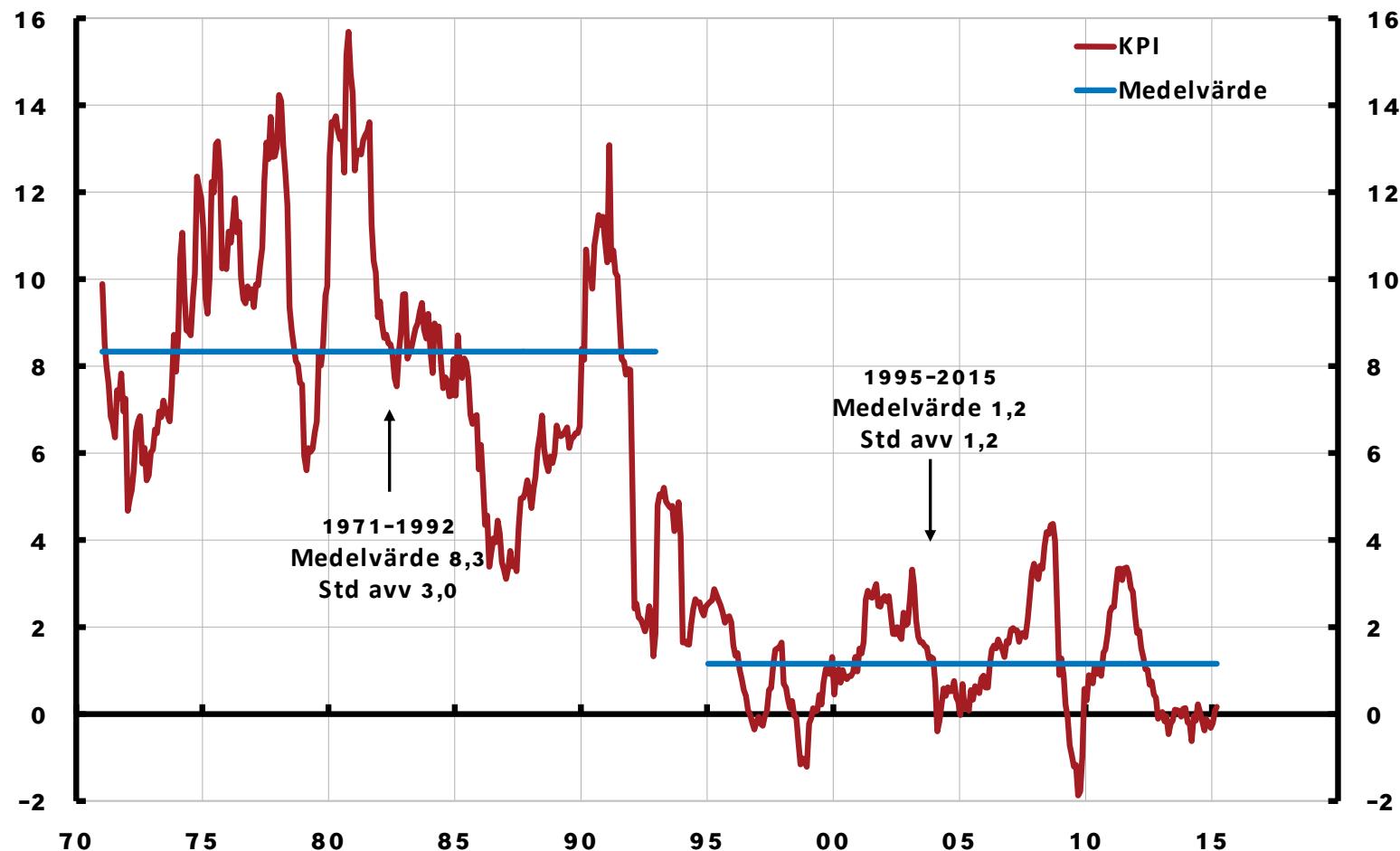
- Central banks typically aim at inflation around 2 percent
 - Strike balance between costs of high and low inflation
 - Stable inflation is thought to imply stable economy
 - We have a good measure that is reliable and not revised subsequently
 - Provide "nominal anchor"

Common features of inflation targeting

- Numerical target for inflation
- Flexible exchange rate
- Independence from political system
- Transparency
- Inflation forecast as a guide to policy decision:
"inflation forecast targeting"

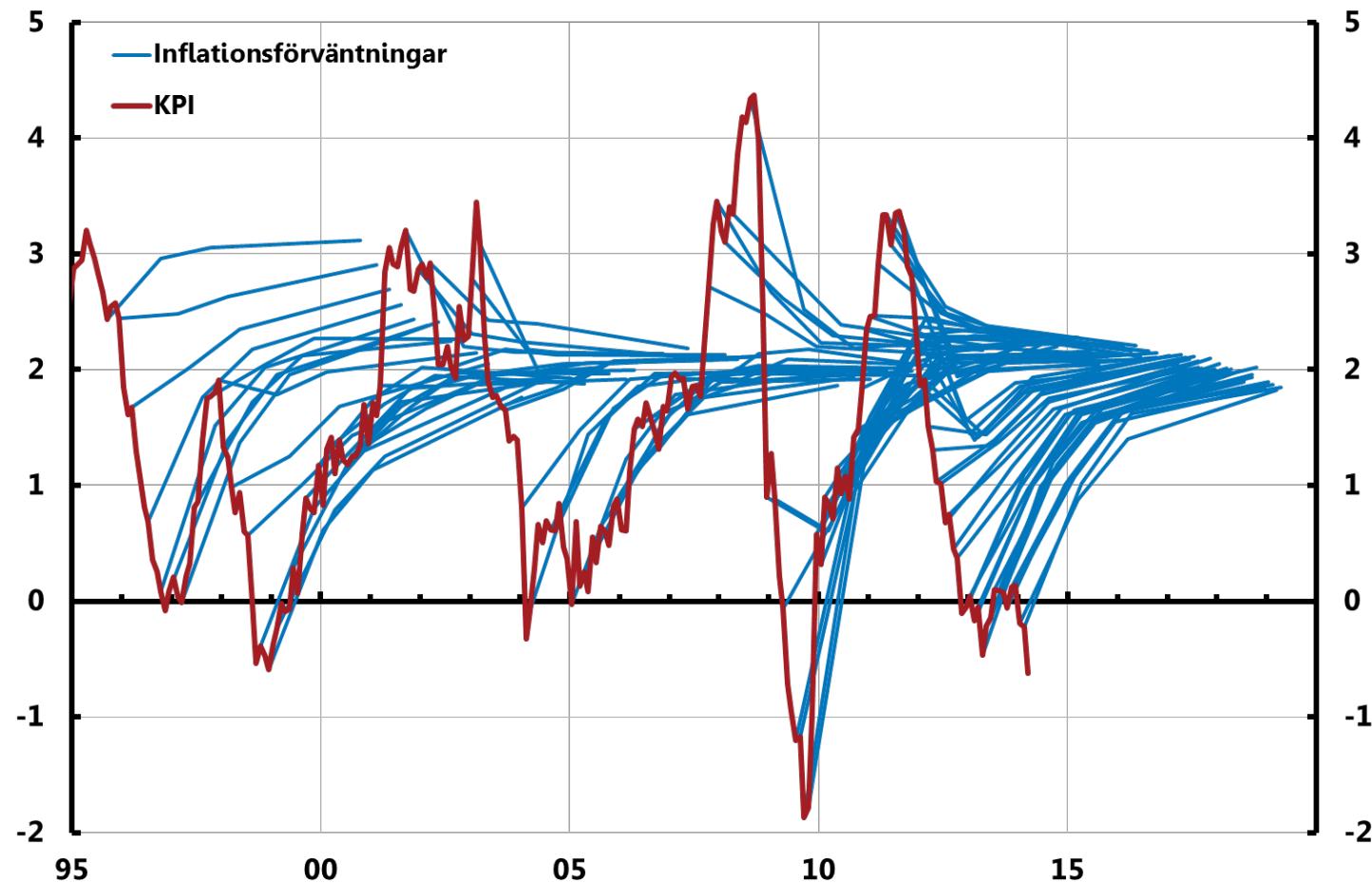
The inflation target has led to lower and more stable inflation...

CPI, annual percentage change



...and inflation expectations have been anchored around the target

Inflation expectations, all respondents



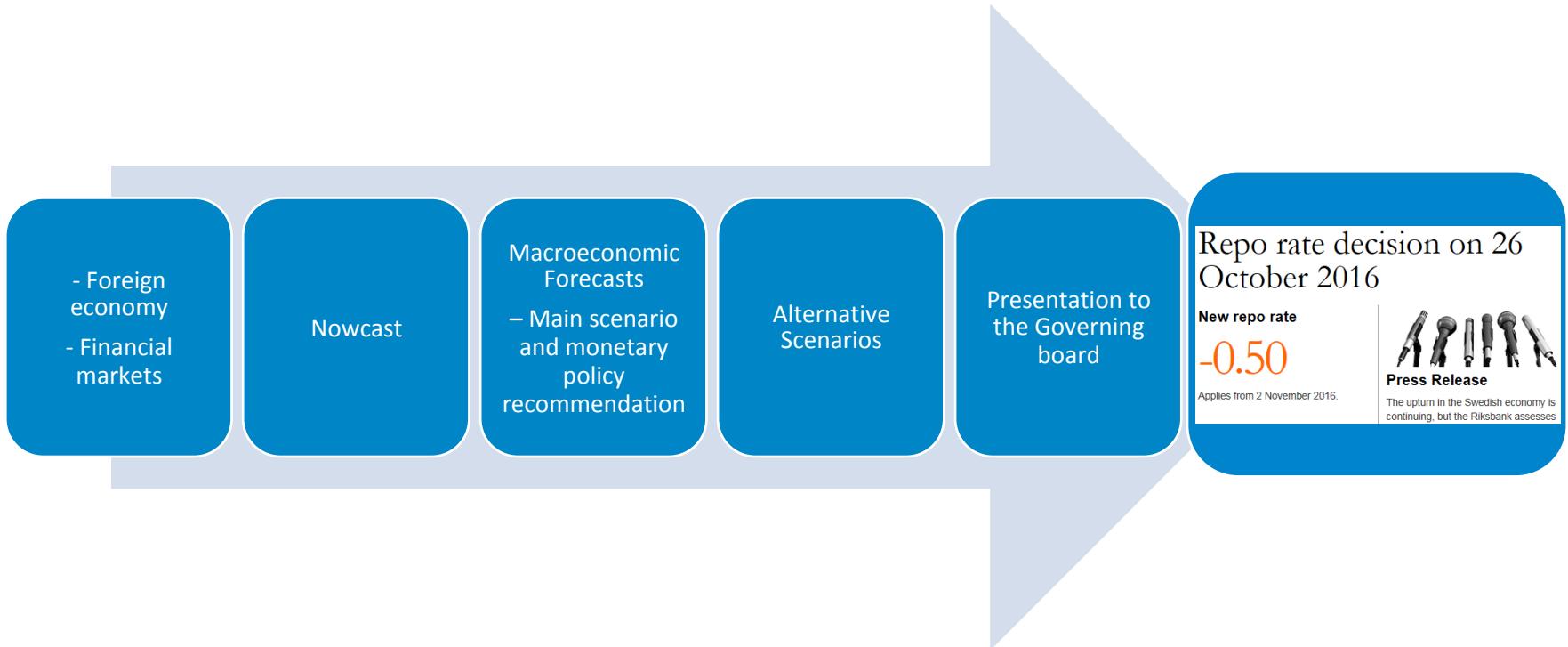


Policy process

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Policy process

- 6 monetary policy meetings per year



Models at Riksbank

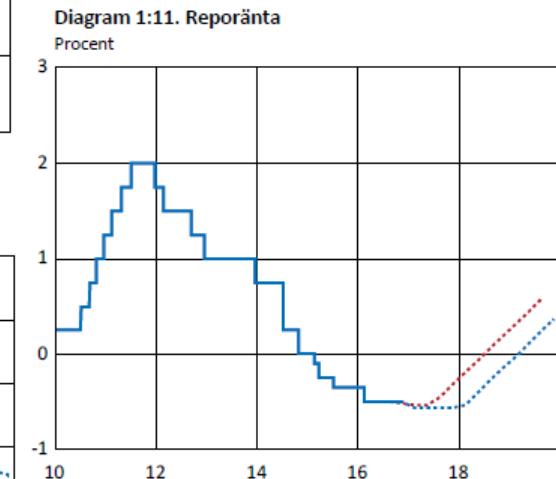
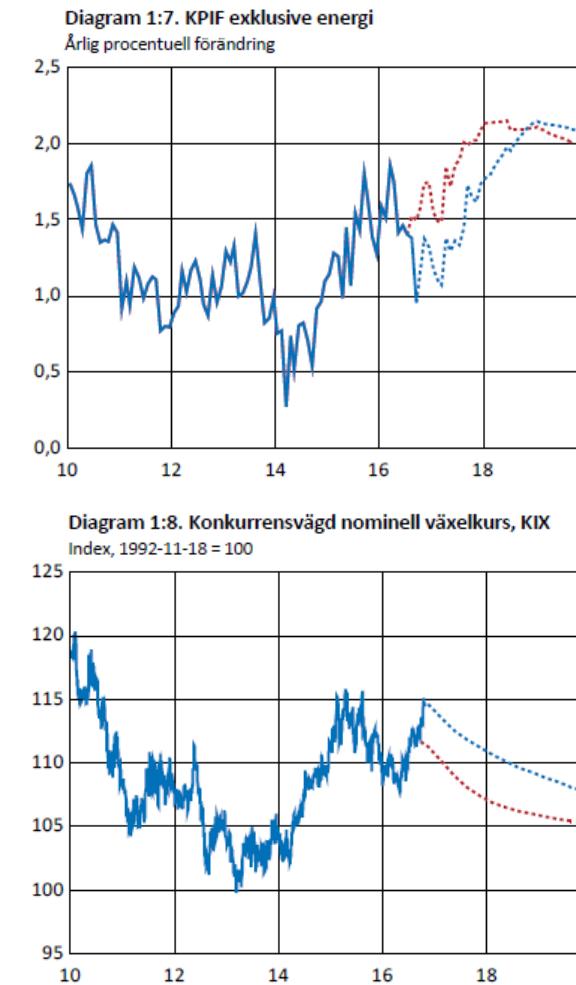
- Why we use models:
 - World is complex, models help us simplify the world
 - They help us structure the transmission mechanisms and explain the data
- Models we use:
 - DSGE models: forecasts, help us tell stories, and build scenarios
 - Time-series models: good forecasting performance

The different models used in the policy process

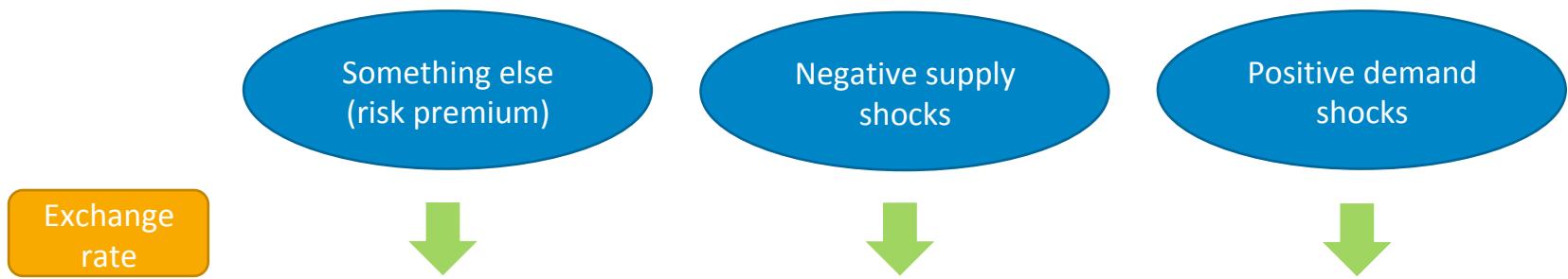
- **Ramses II:** DSGE. Our main model **Moses:** Semi structural model (VECM)
- **BVAR:** Time series model. Lately, the best forecaster for inflation and Repo rate
- **Satellite models:**
 - Gerali et al (2010)
 - Sigma
 - ...

Forecasts

- Example from October 2016:
 - inflation lower than expected, exchange rate weaker than expected
- Theory: Negative demand shock, need more expansionary monetary policy



Disentangling the appreciation in the exchange rate



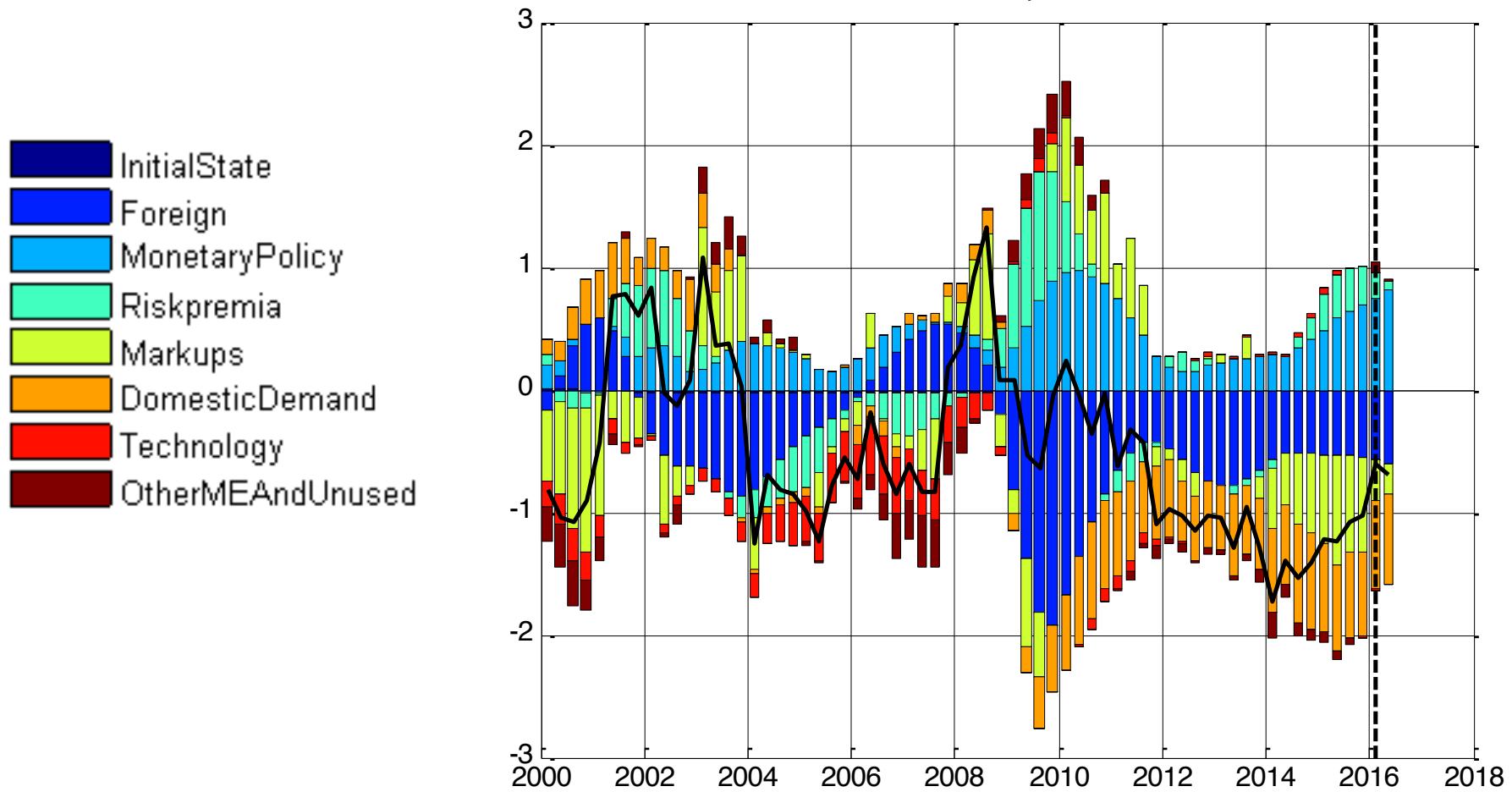
Implication on GDP and inflation forecast:





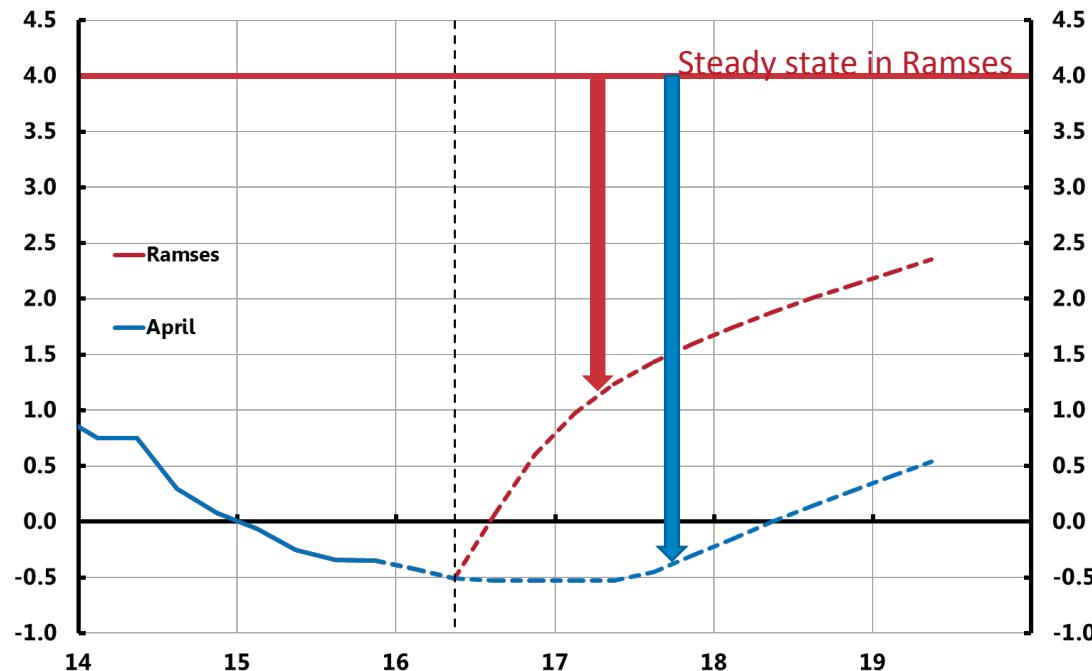
DSGE models: stories

Revisions decomposition CPIF

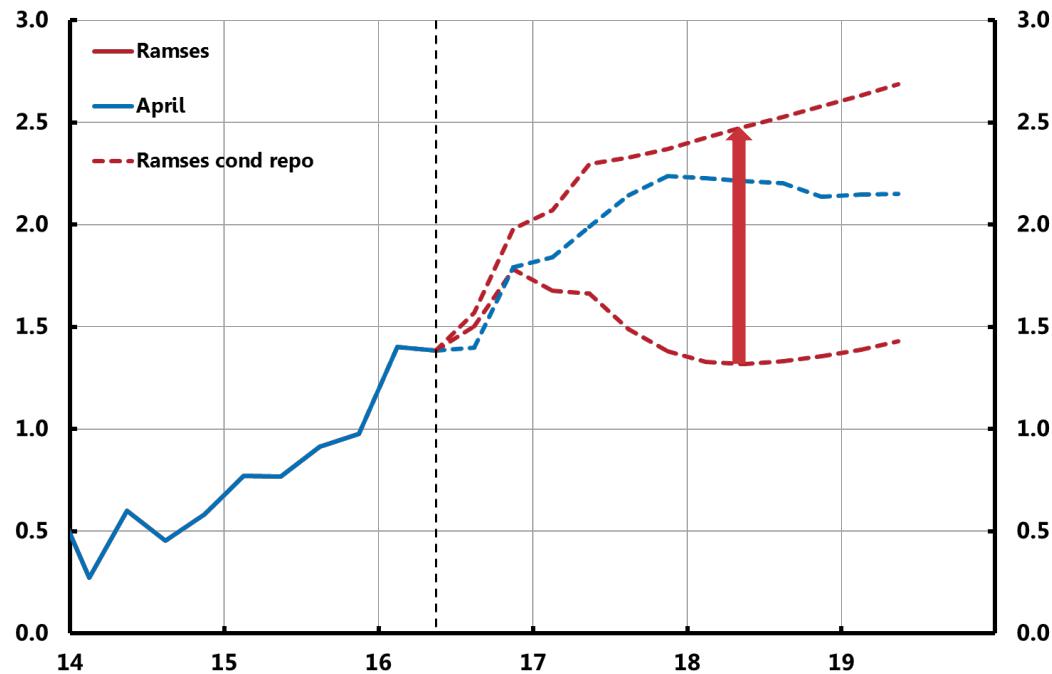


Ramsey forecast of repo rate is higher,

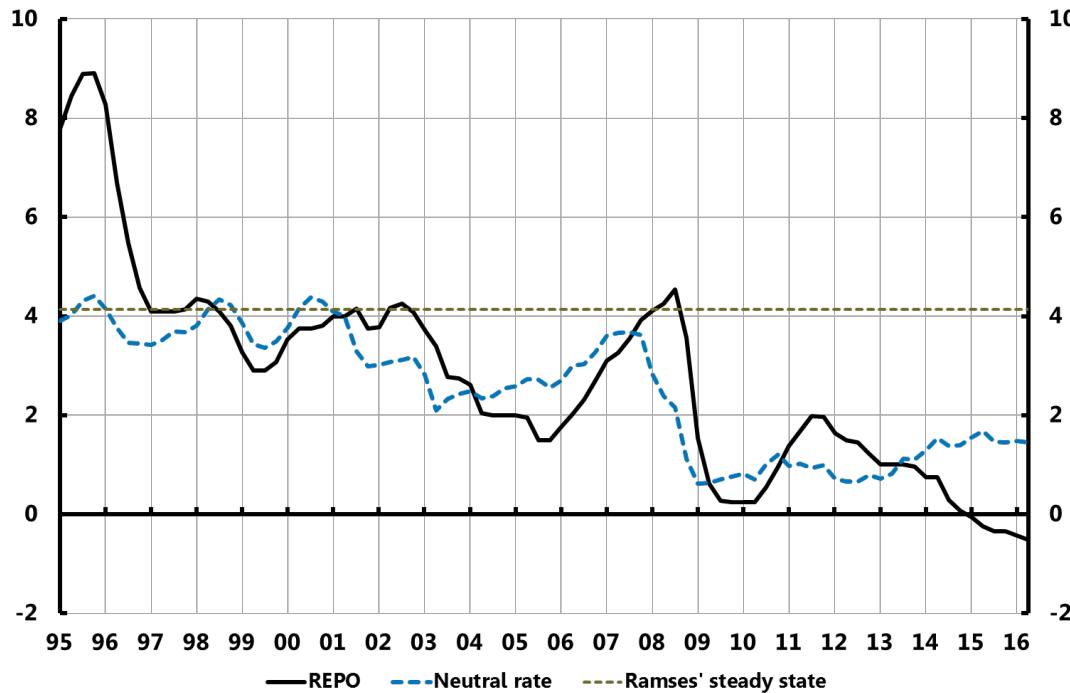
Taylor rule: $i = \rho(i_{t-1} - i^*) + (1-\rho)[r^\pi(\pi_t - \pi) + r^y(y_t - y)]$



CPIF forecasts from Ramses conditional on foreign Y,P,i

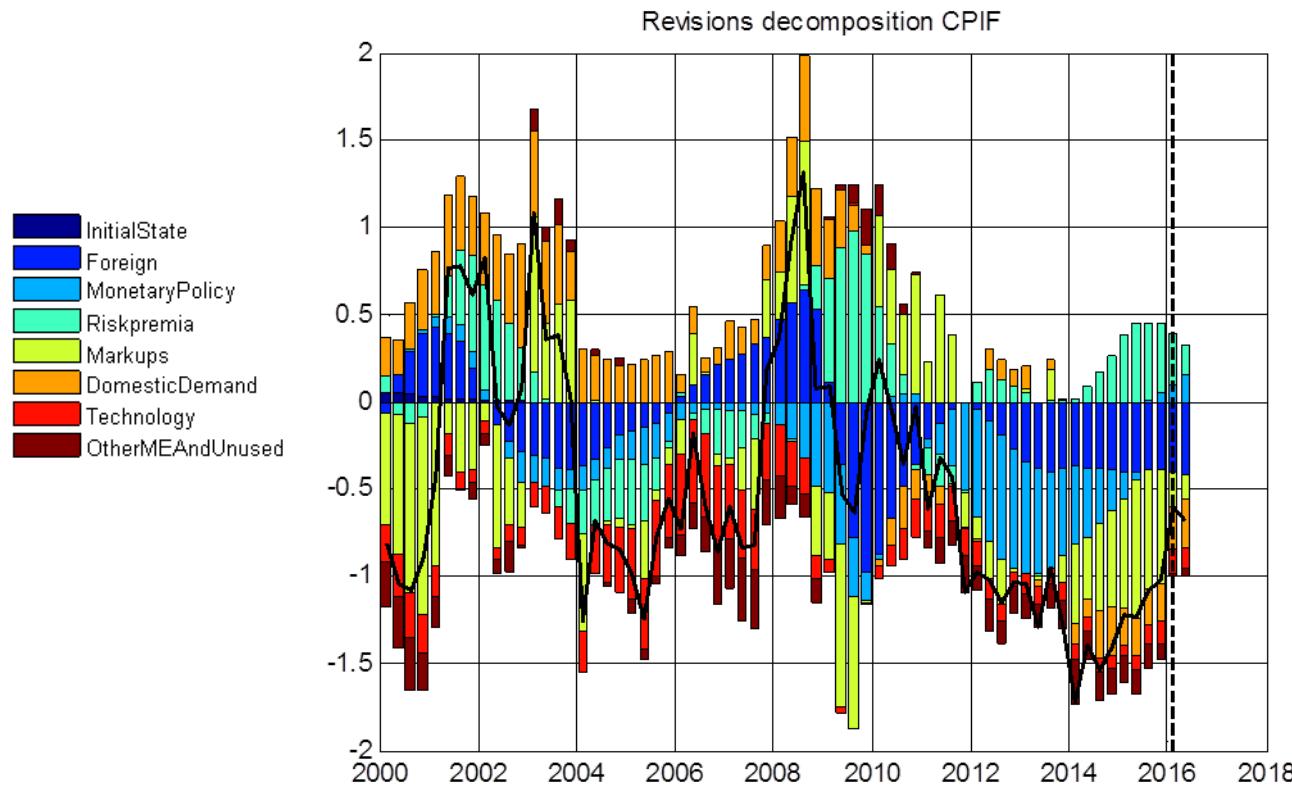


Is the "Neutral rate" low? Not for Ramses=> big role of MP shocks



Lower neutral rate in Ramses

Demand shocks disappear



DSGE models: scenarios

- **Jul-16** The result of United Kingdom referendum on the EU creates uncertainty
- **Feb-16** Risks inherent in a rapid appreciation of the krona in a low inflation environment
- **Dec-15** Refugee immigration is deemed to have only minor effects on monetary policy in the near future

Scenario Dec 15: Immigration

- **Scenario:**
 - First immigrants arrive and government provides them housing, food, education, etc.
 - *Increase in government consumption:* GDP and inflation increase
 - Later, from 2017 onwards slowly enter the labour market
 - *Labour supply increases:* wages and inflation fall
 - Overall in the forecasting period, the effects on inflation cancel each other out
- **Scenario in practice, using models**
 - What is the effect of increasing government spending by x billion SEK on inflation and GDP?
 - What is the effect of increasing labour supply by x persons on inflation?

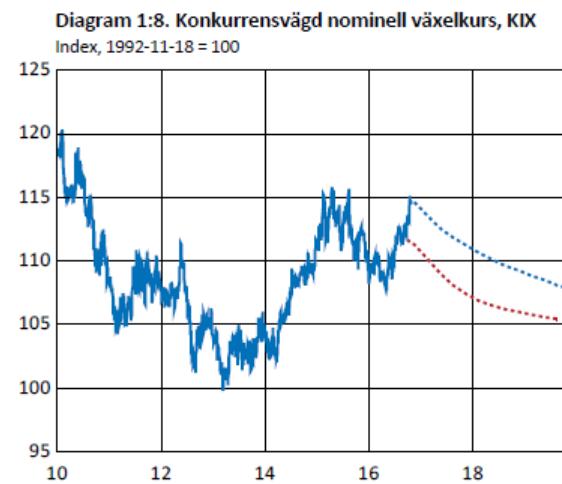
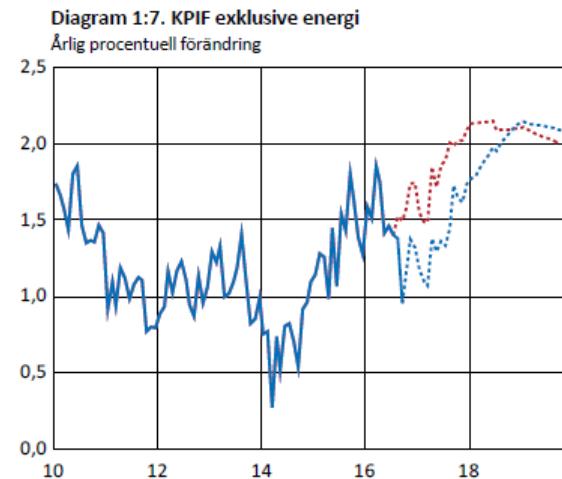
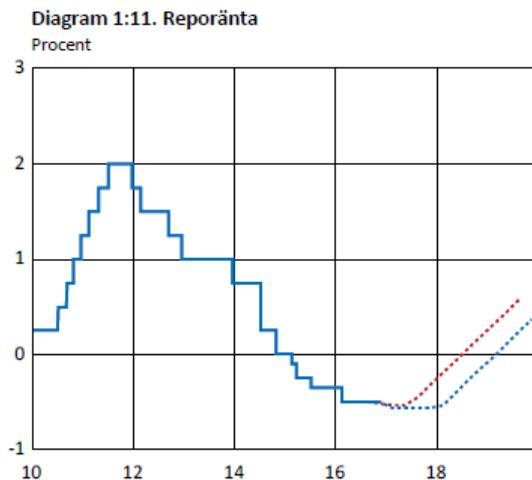


Central bank toolkit and transmission

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Example from Oct 2016 policy meeting

- Inflation lower than expected, exchange rate weaker than expected.
- Theory: Negative demand shock, need more expansionary monetary policy



Press Release

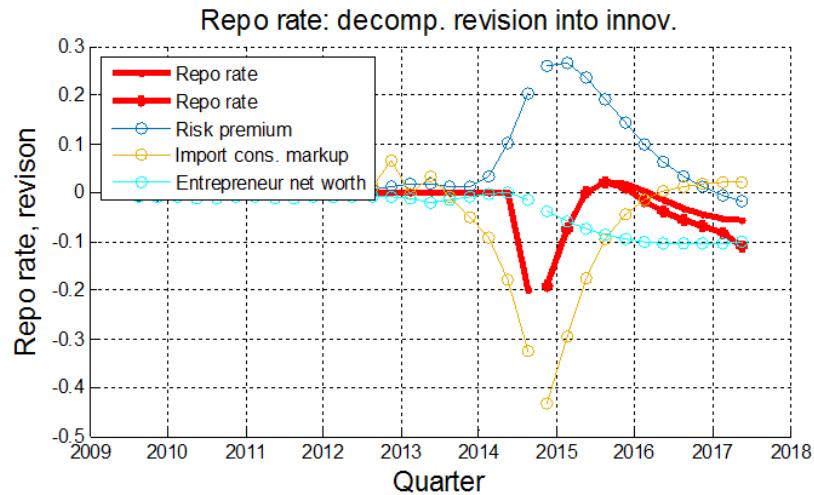
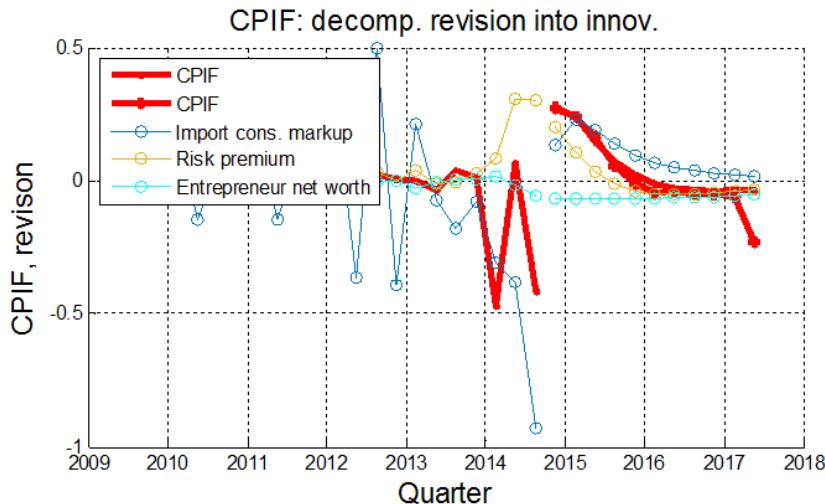
The upturn in the Swedish economy is continuing, but the Riksbank assesses that it will take longer before inflation attains the target of 2 per cent. The upturn in inflation therefore needs continued strong support. The

Executive Board assesses that the repo rate needs to be held at -0.50 per cent for six months longer than was forecast in September. The probability that the rate will be cut further has increased. The purchases

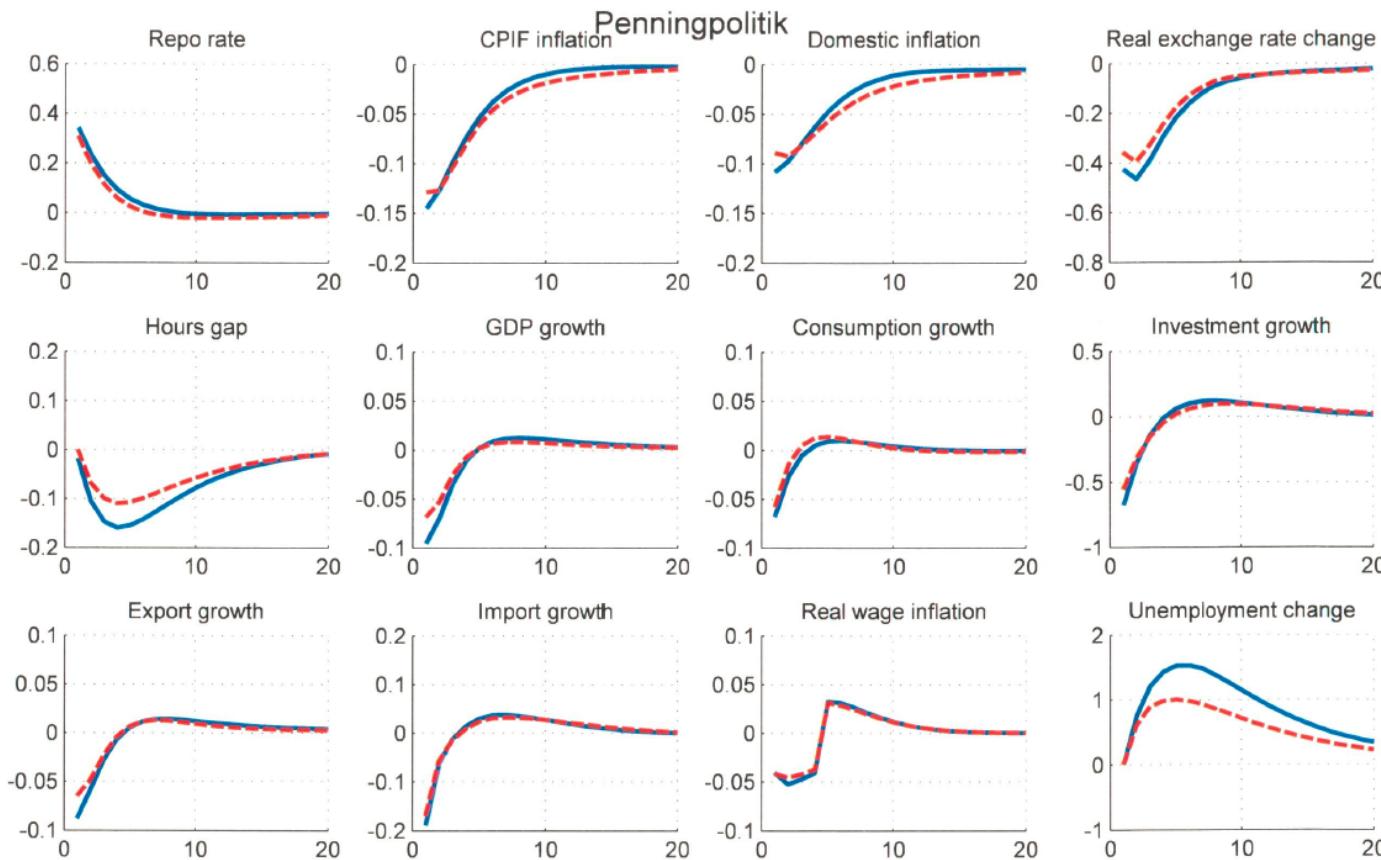
of government bonds will continue during the second half of 2016, as decided in April. Prior to the monetary policy meeting in December, the Executive Board is prepared to extend the purchases of government bonds.

[Read the press release](#)

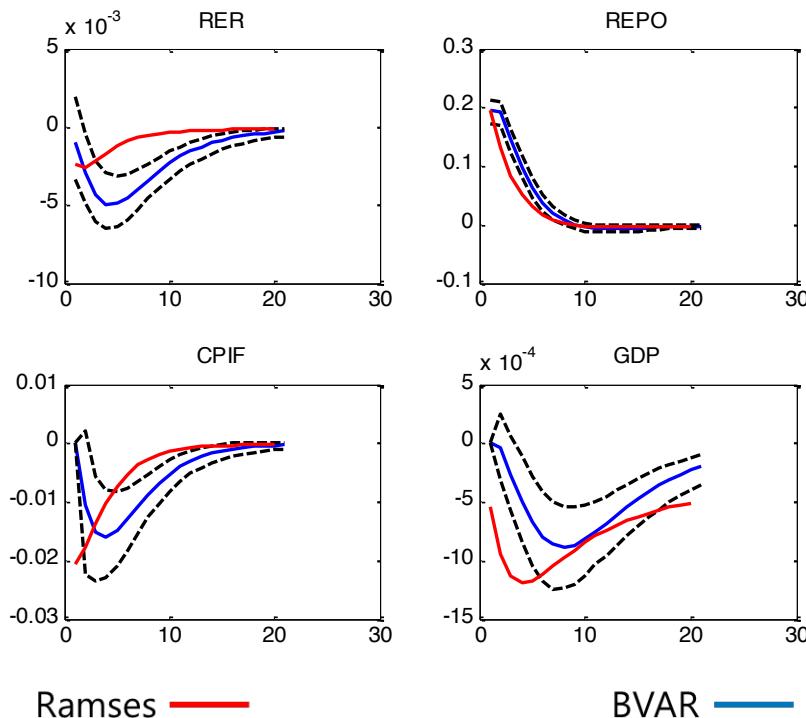
Revision decompositions: inflation and the repo rate



Impulse response function to a monetary policy shock

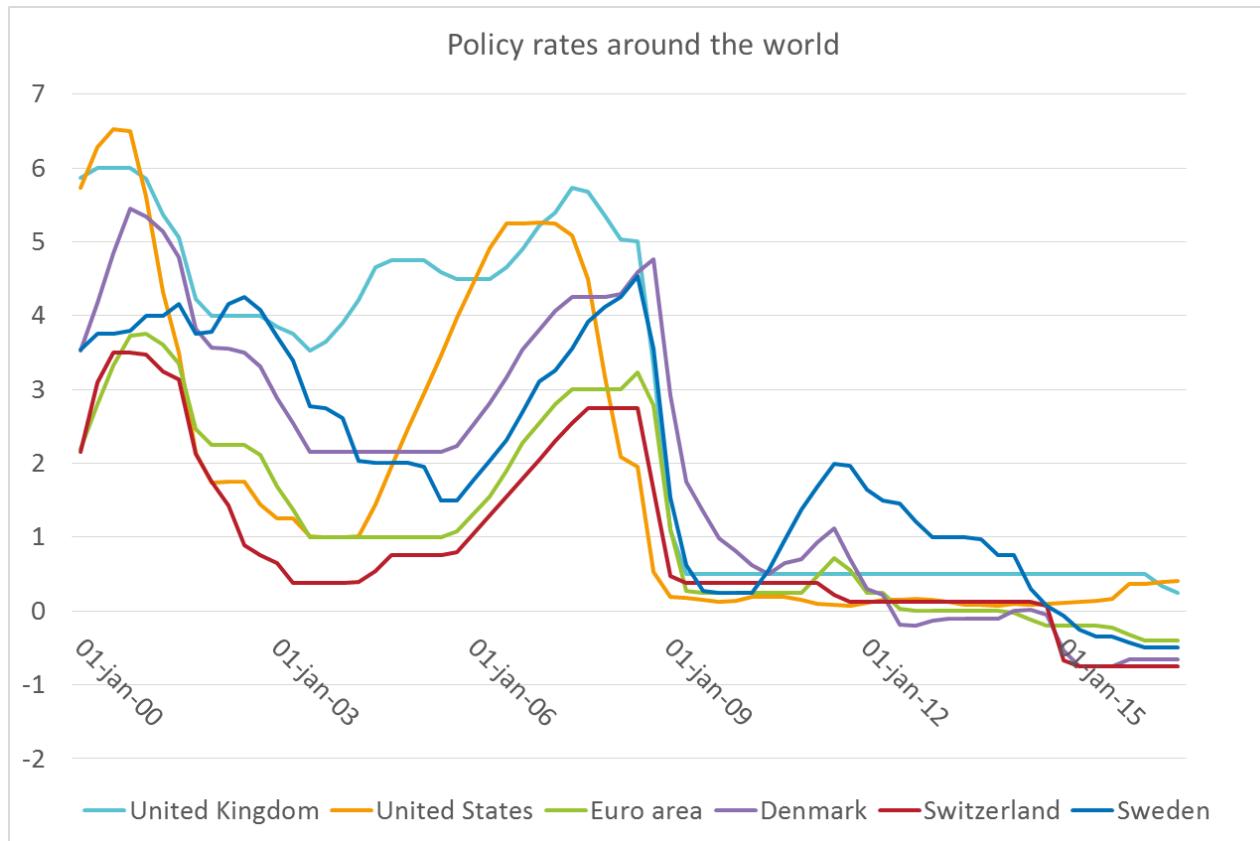


Comparing Ramses IRFs with BVAR



Conventional monetary policy

- Policy rate movements: There is a lower bound
 - From *Zero* lower bound to *Effective* lower bound

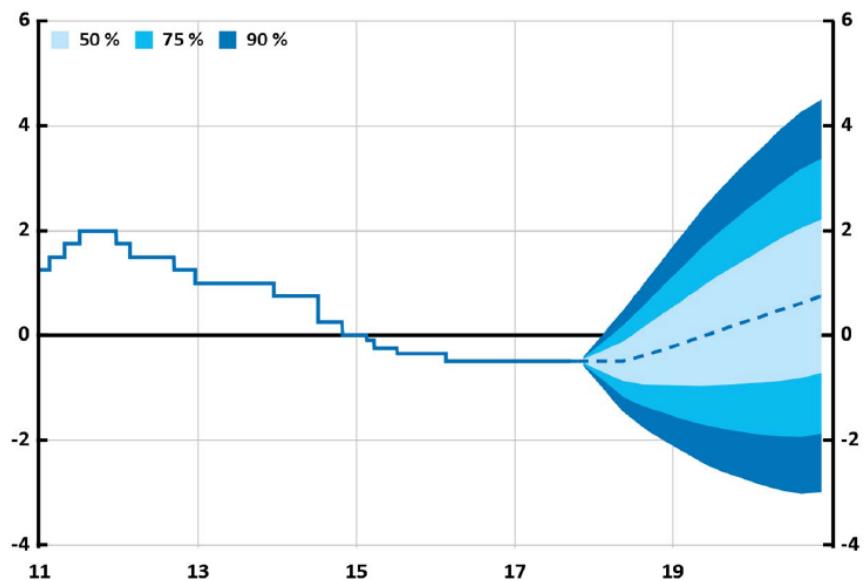


Currently used/assessed tools

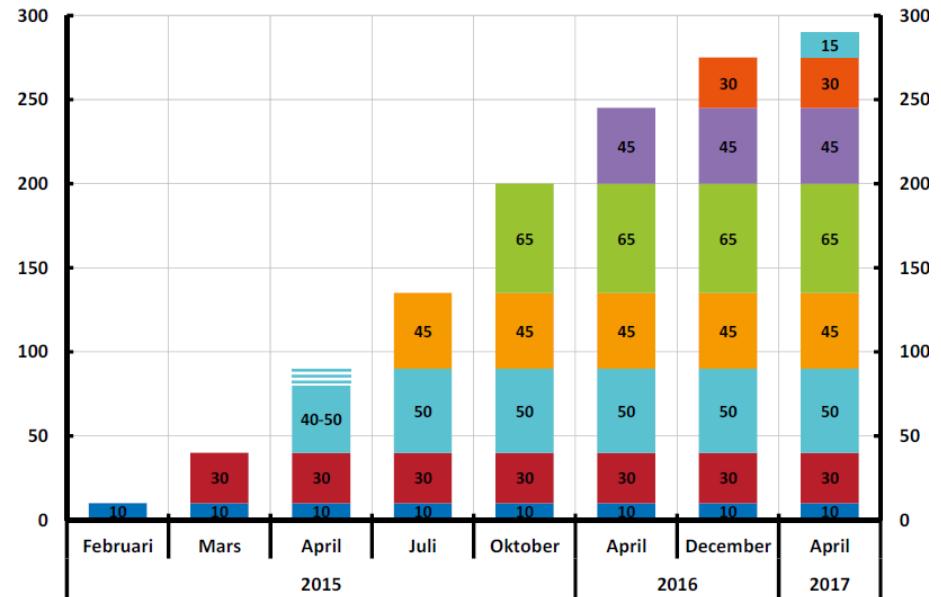
- Conventional
- Unconventional
 - QE (Fed, BOE, ECB, Riksbank, BOJ)
 - Forward guidance
 - Exchange rate interventions (Swiss National Bank, Bank of Israel)
 - Lending to firms – LTROs (ECB)
 - Purchasing corporate bonds (ECB, Fed)
 - Helicopter drops (theoretical possibility)

“Unconventional” monetary policy

Negative repo rate



Purchase of government bonds up until the end of December 2017



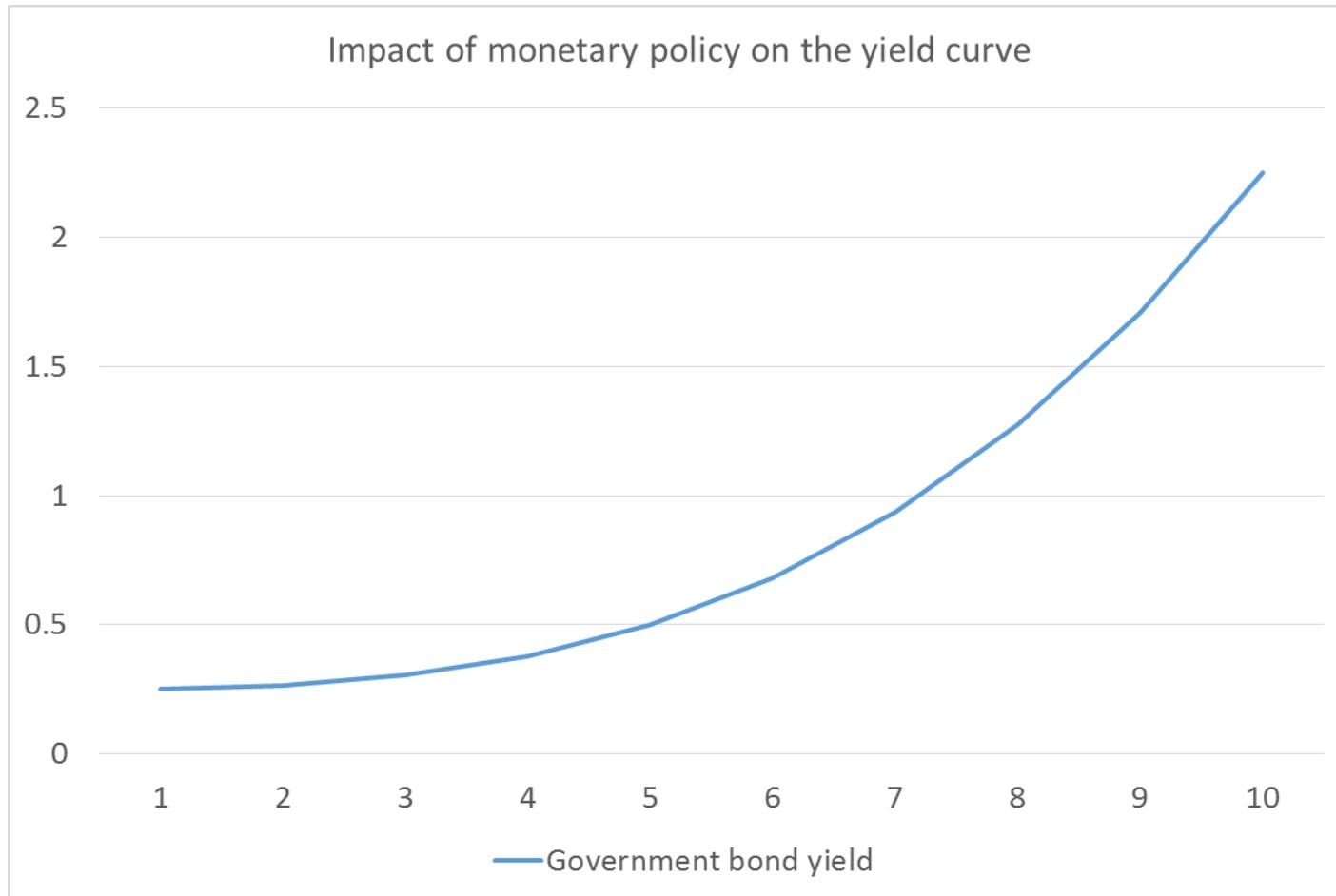
Per cent and SEK billion.

Source: The Riksbank

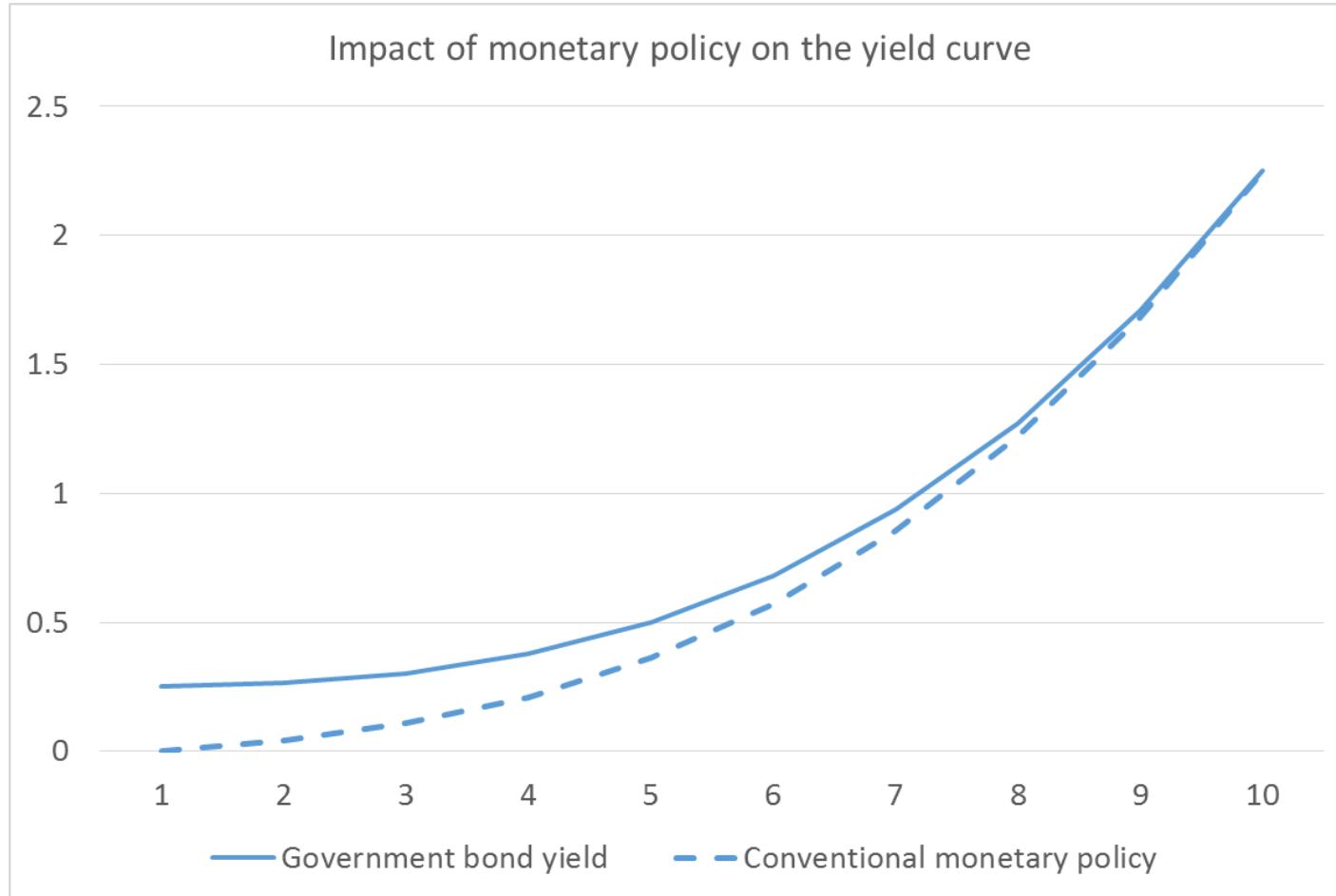
Channels of unconventional monetary policy

- **Portfolio balance channel**
 - Some investors have preference for long-term assets, require a premium to induce to sell them (preferred habitat investors Vayanos and Vila 2009)
- **Signalling channel**
 - Signal about keeping interest rates lower for longer (Eggertson and Woodford 2003)
- **Liquidity channel**
 - Banks have more reserves, leading to lower lending costs. Do not need to go on overnight market, buy other riskier assets
- **Scarcity channel**
 - Agents need government bonds as collateral, when central bank buys them, those bonds become more scarce (D'amico, Fan, Kitzul (2014))

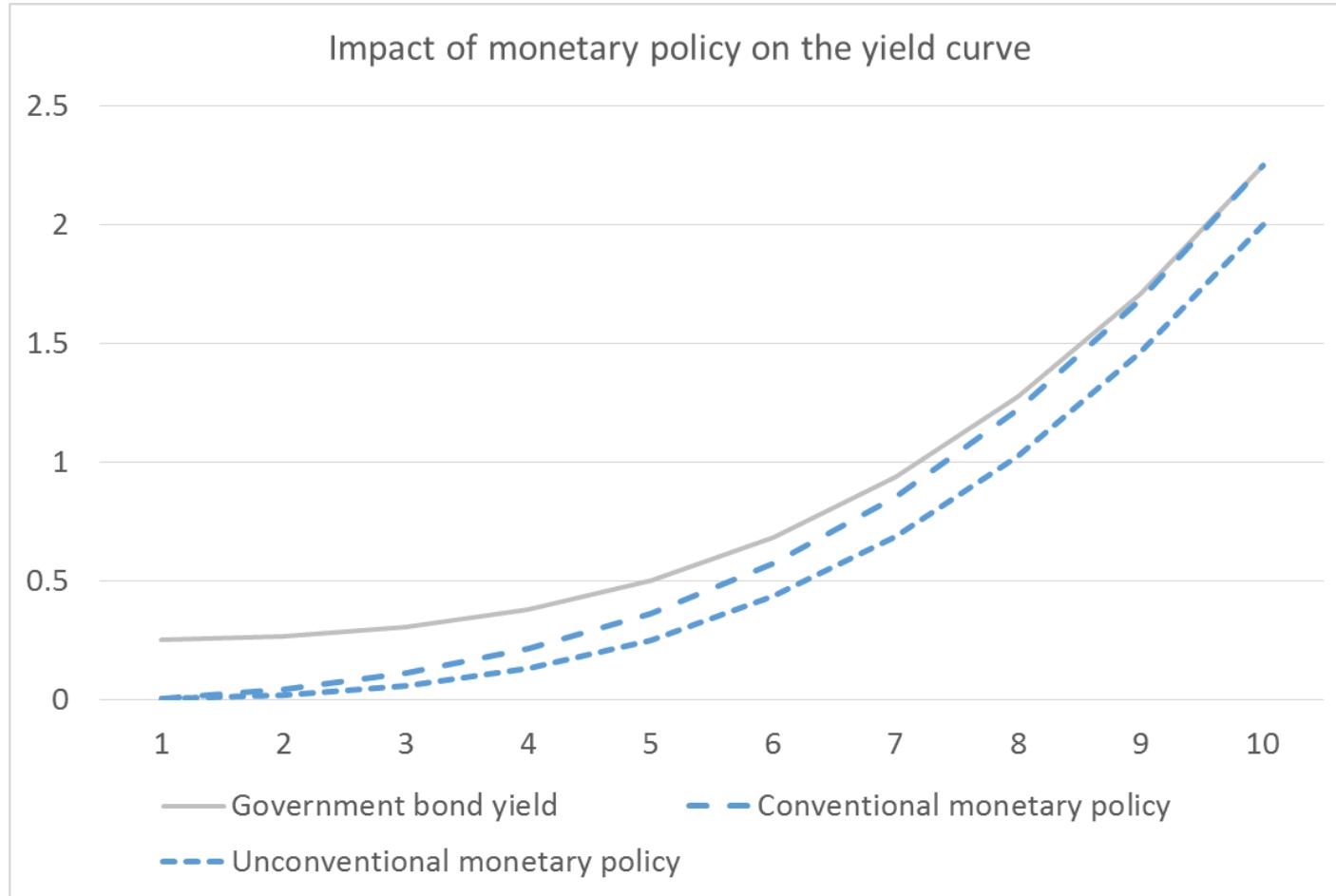
Government bond yield curve



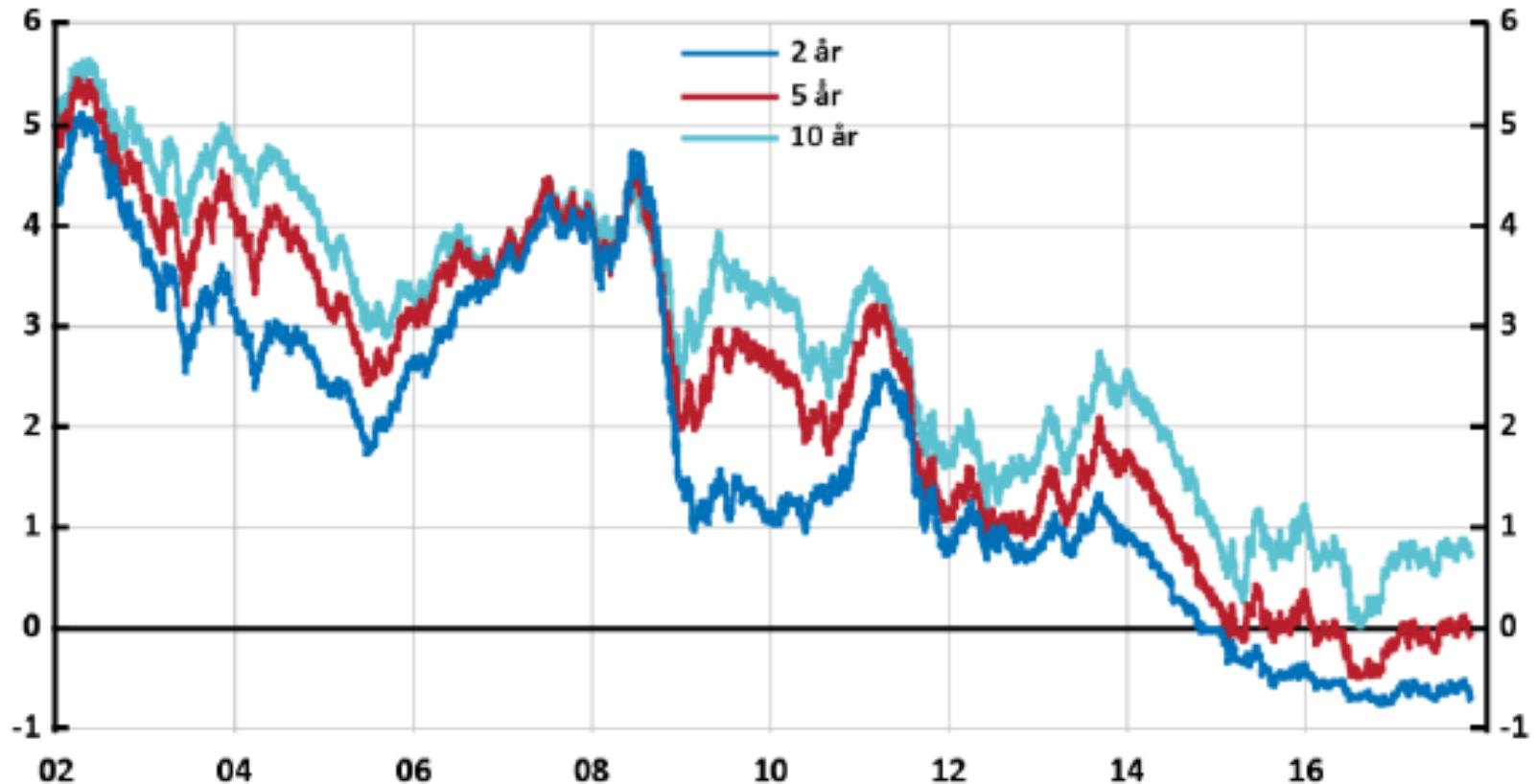
Conventional monetary policy



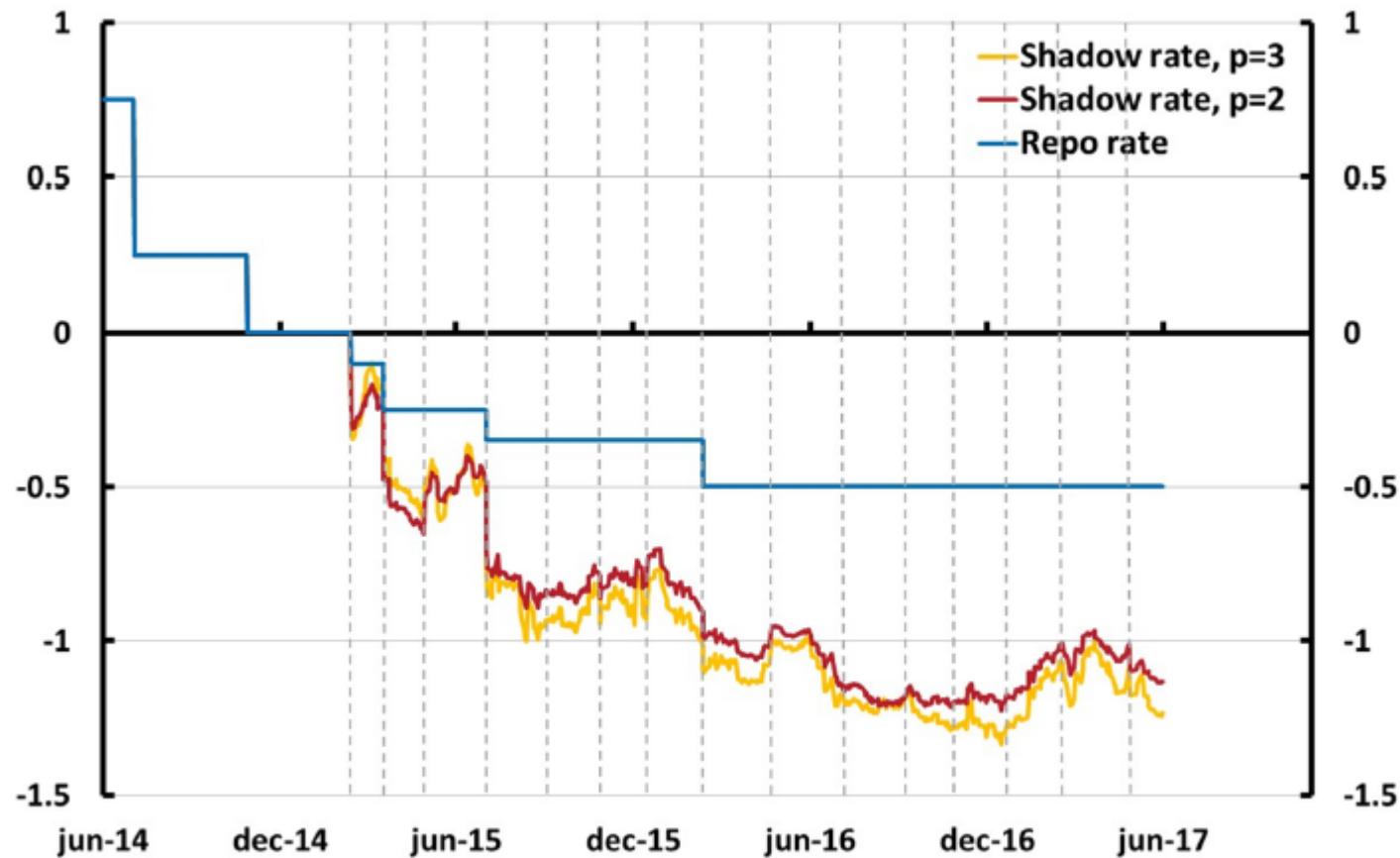
Unconventional monetary policy



Yields have moved down with monetary policy



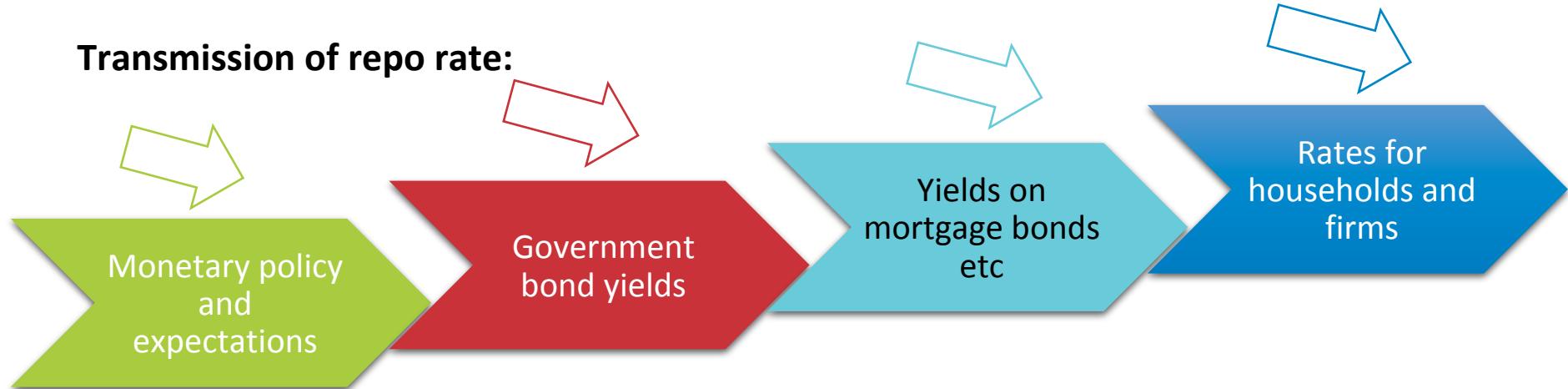
Shadow rate



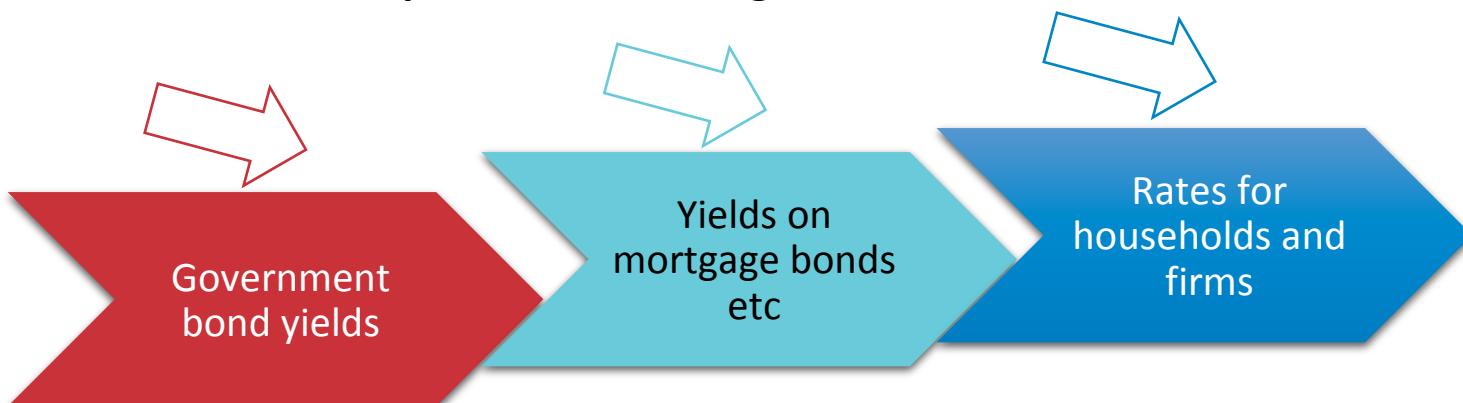
De Rezende, Ristiniemi (forthcoming)

The monetary policy affects “final rates”

Transmission of repo rate:

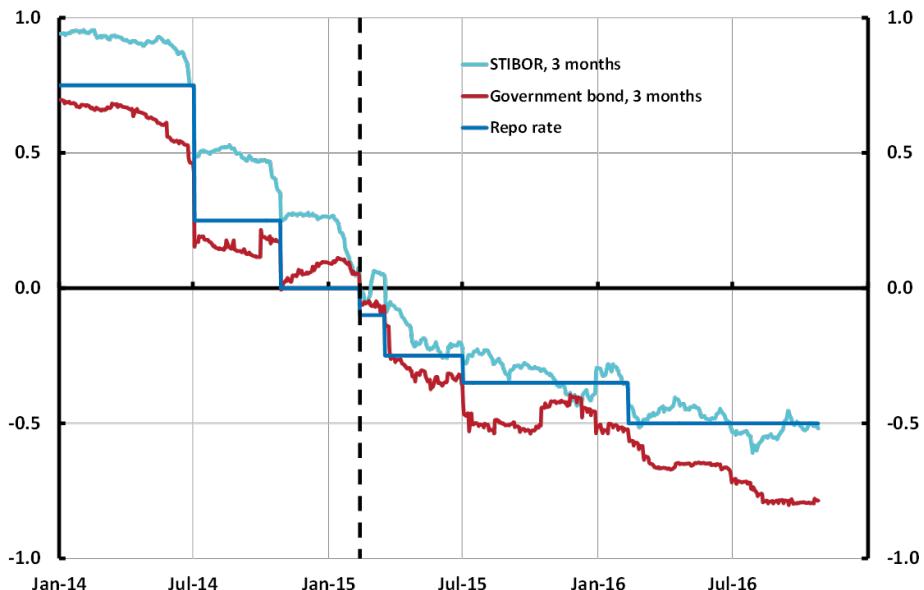


Transmission of quantitative easing:

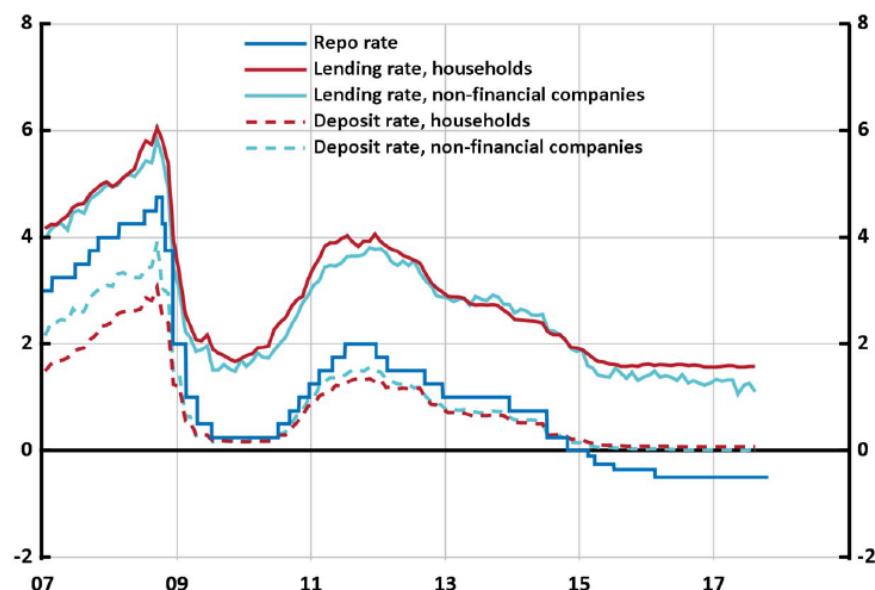


Many interest rates have fallen with the repo rate and QE impact on yields

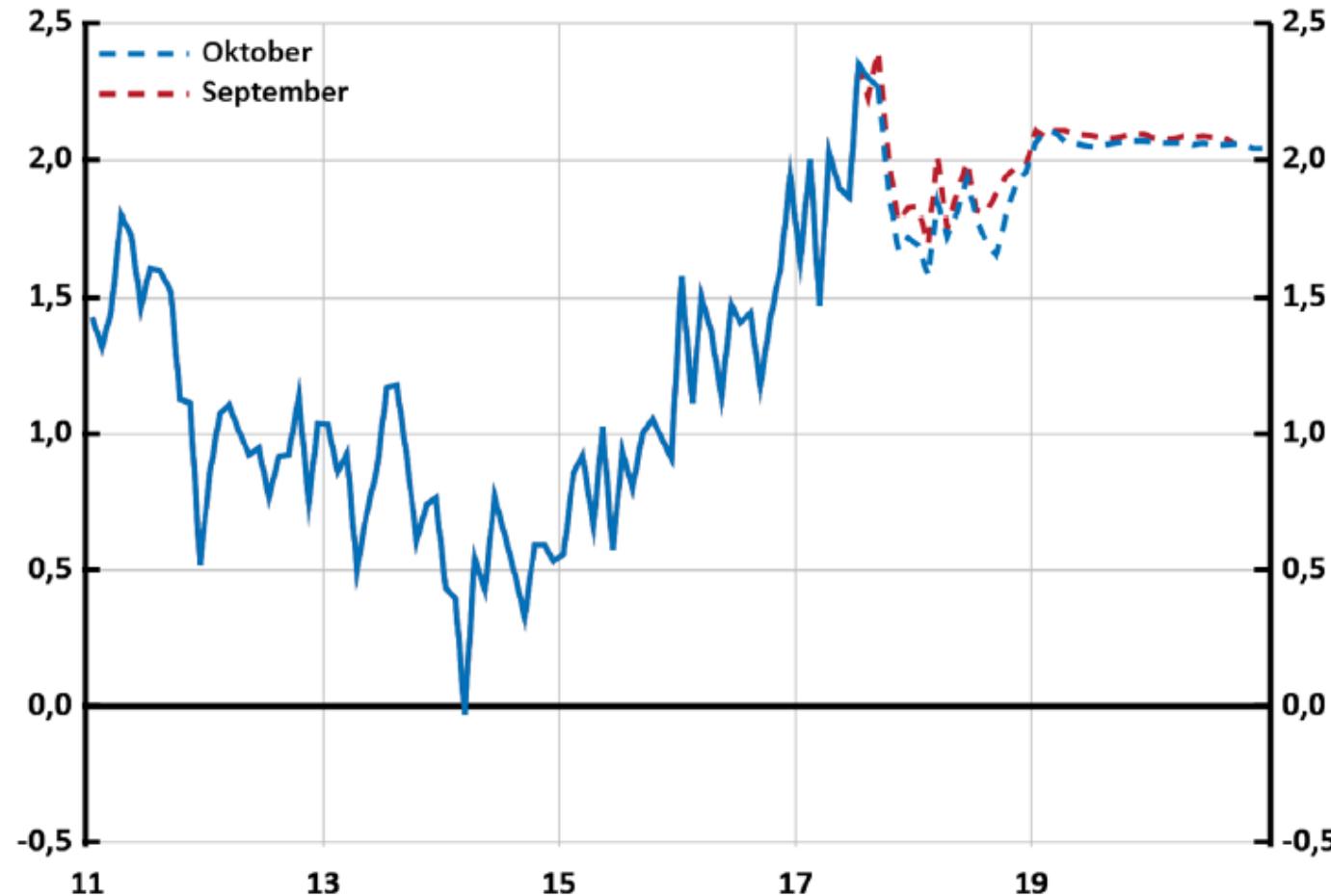
Many market rates are now negative



Lending rates have fallen, but deposit rates stopped at zero



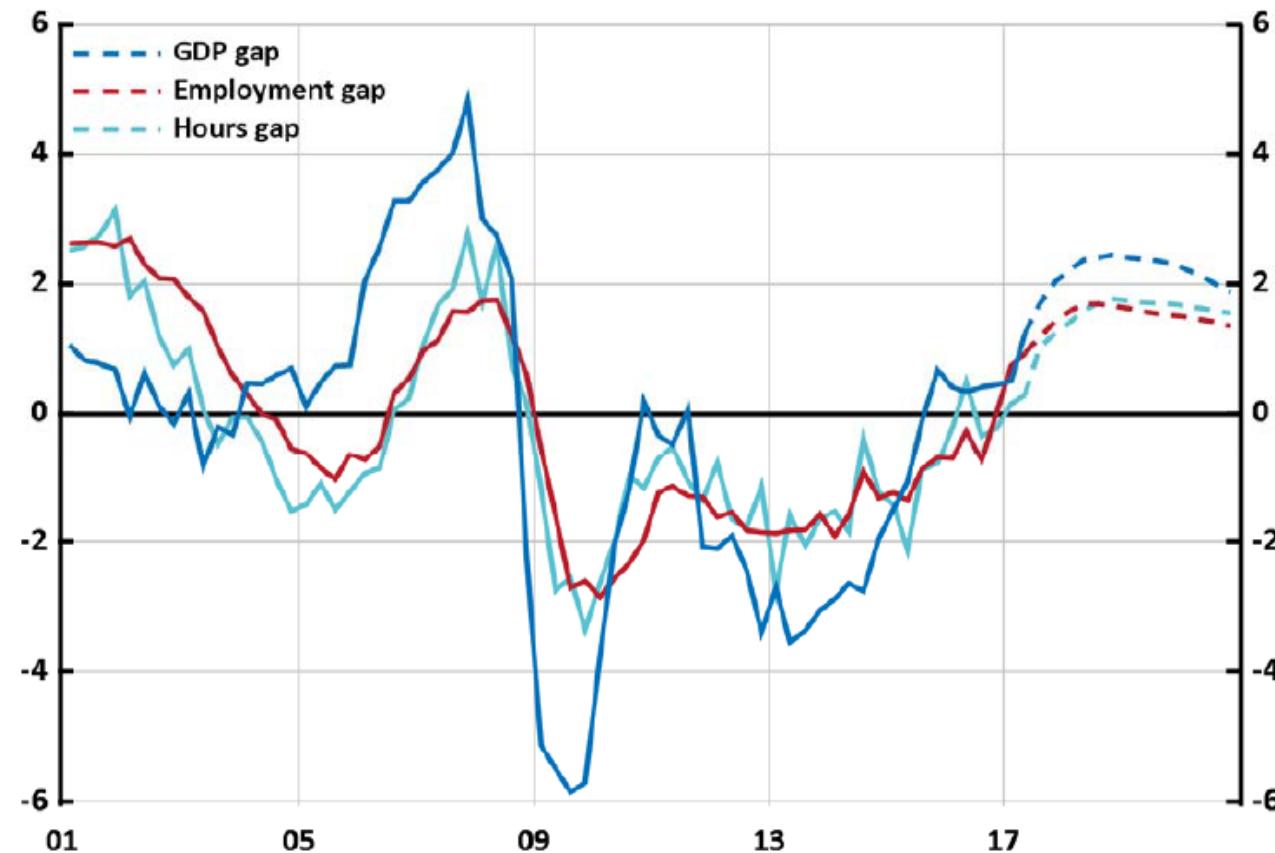
Inflation is rising towards the target



Sources: Statistics Sweden and the Riksbank

Economy is growing

Per cent



Note. The gaps refer to the deviation in GDP, the number of hours worked and the number of those employed from the Riksbank's assessed trends.

Sources: Statistics Sweden and the Riksbank

Transparency and monetary policy

- Transparency has many purposes
- Helps evaluation
 - Important for independent central bank
- Increases stability
 - Manage expectations
- Improves transmission of policy
- Long tradition in Sweden

Monetary policy needs to balance different risks

- **Low interest rates create risks**
 - Too much risk taking in financial markets
 - Booming housing market and growing household debt
 - Low interest rates a global phenomenon, partly structural
- **Risks of quantitative easing**
 - Scarcity of bonds, liquidity issues (Ferdinandusse, Feier, Ristiniemi 2017)
 - Inequal distribution of returns. Asset prices increase, but are owned by wealthy, however employment also increases and benefits mostly people with low income (Lenza and Slacalek, forthcoming)
- **But low inflation also creates risks**
 - Can lose the "nominal anchor"
 - Can lead to instability
- **Good policy mix monetary-fiscal—"macroprudential" is needed. Great challenge**



Where to learn more?

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

More readings...

- www.riksbank.se
- *Monetary Policy Report*, September 2017
- *Monetary Policy in Sweden*, 2010
- Söderström, Ulf and David Vestin, "Svensk penningpolitik", in Hultkrantz, Lars and Hans Tsion Söderström (eds.), *Marknad och politik*, Studentlitteratur, 2014
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- Alsterlind, Jan, Hanna Armelius, David Forsman, Björn Jönsson and Anna-Lena Wretman, "How far can the repo rate be cut?", *Economic Commentaries*, No. 11, 2015
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