

Funding Quantitative Easing to Target Inflation

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Figure 1. Balance Sheets of Four Major Central Banks 2005-15

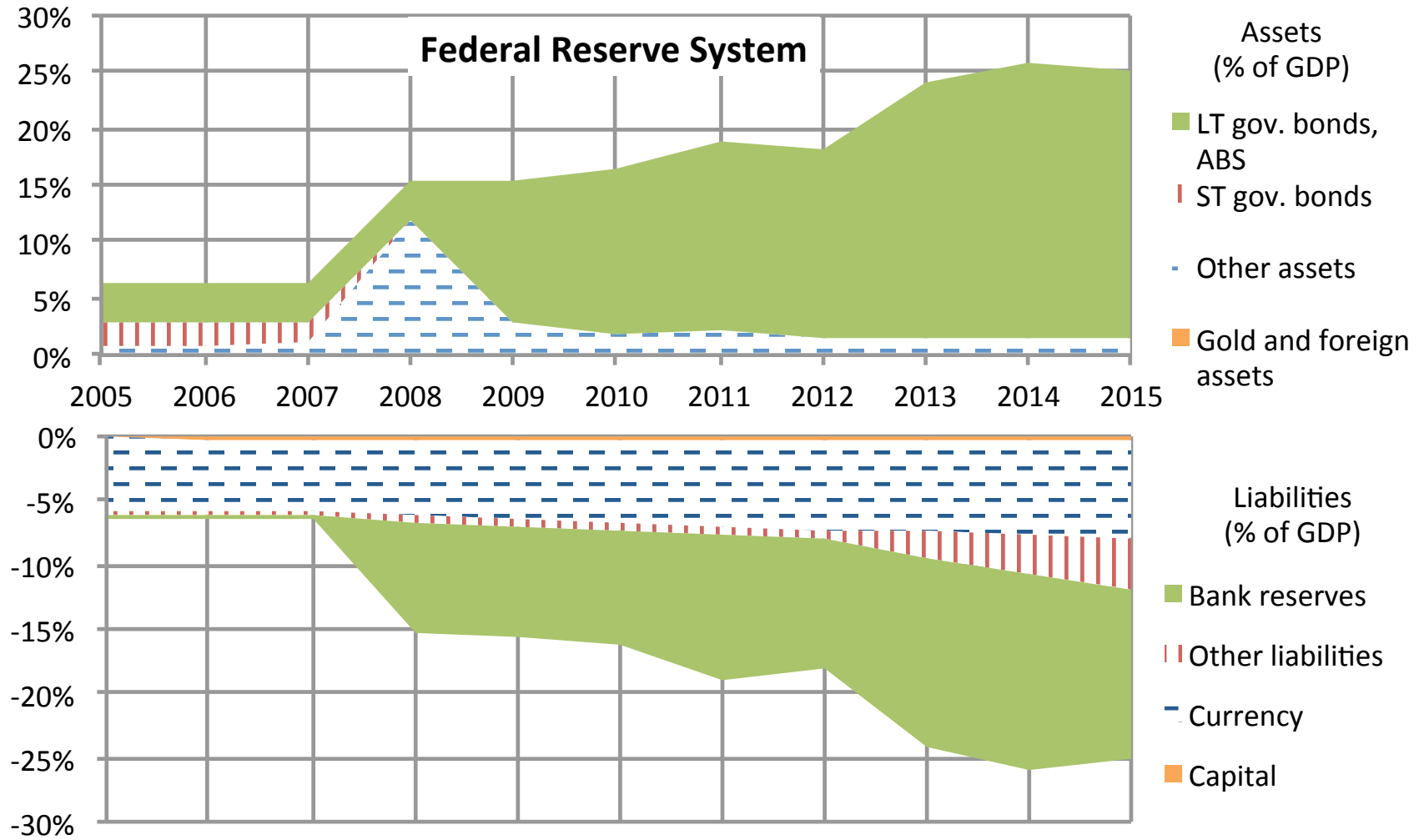


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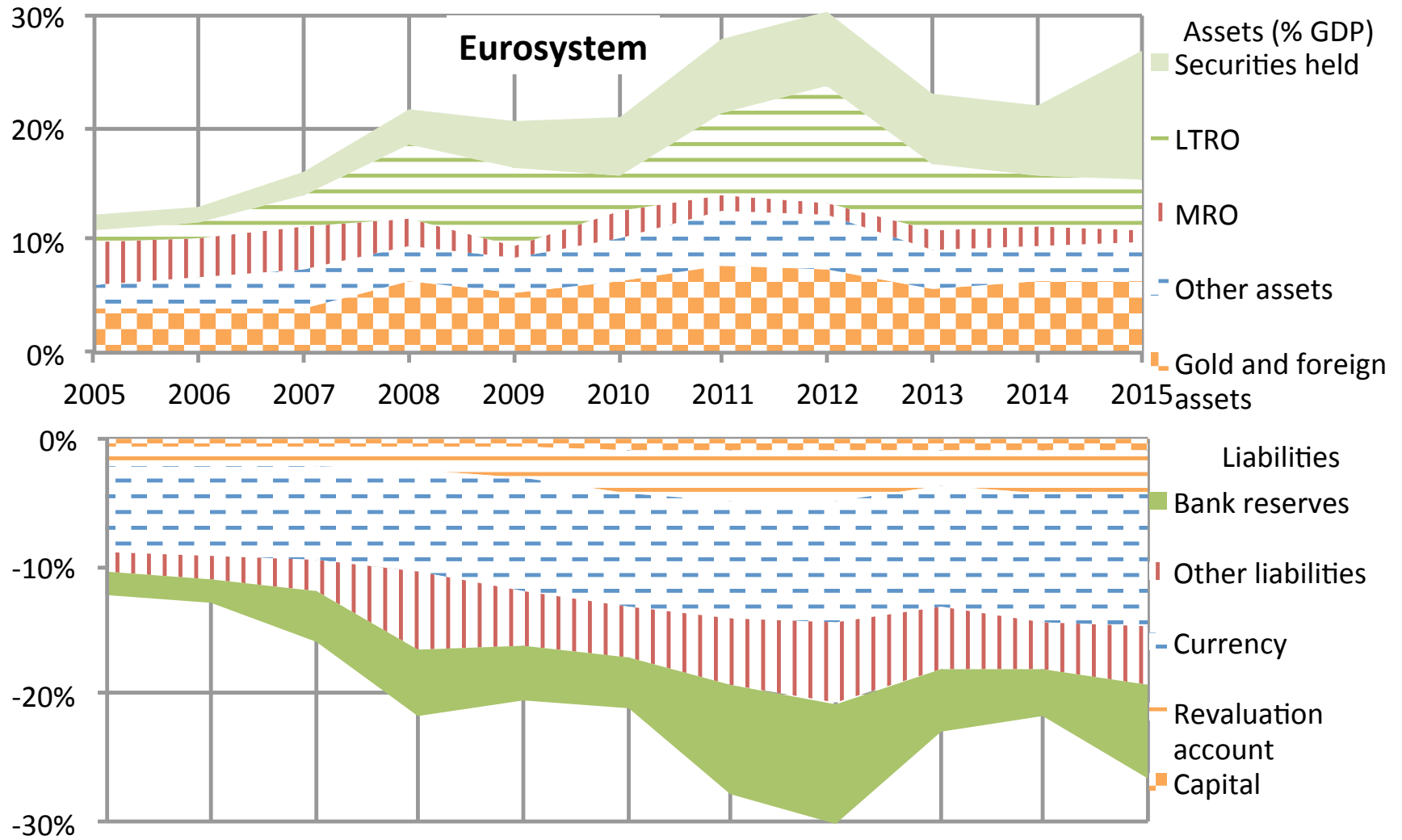


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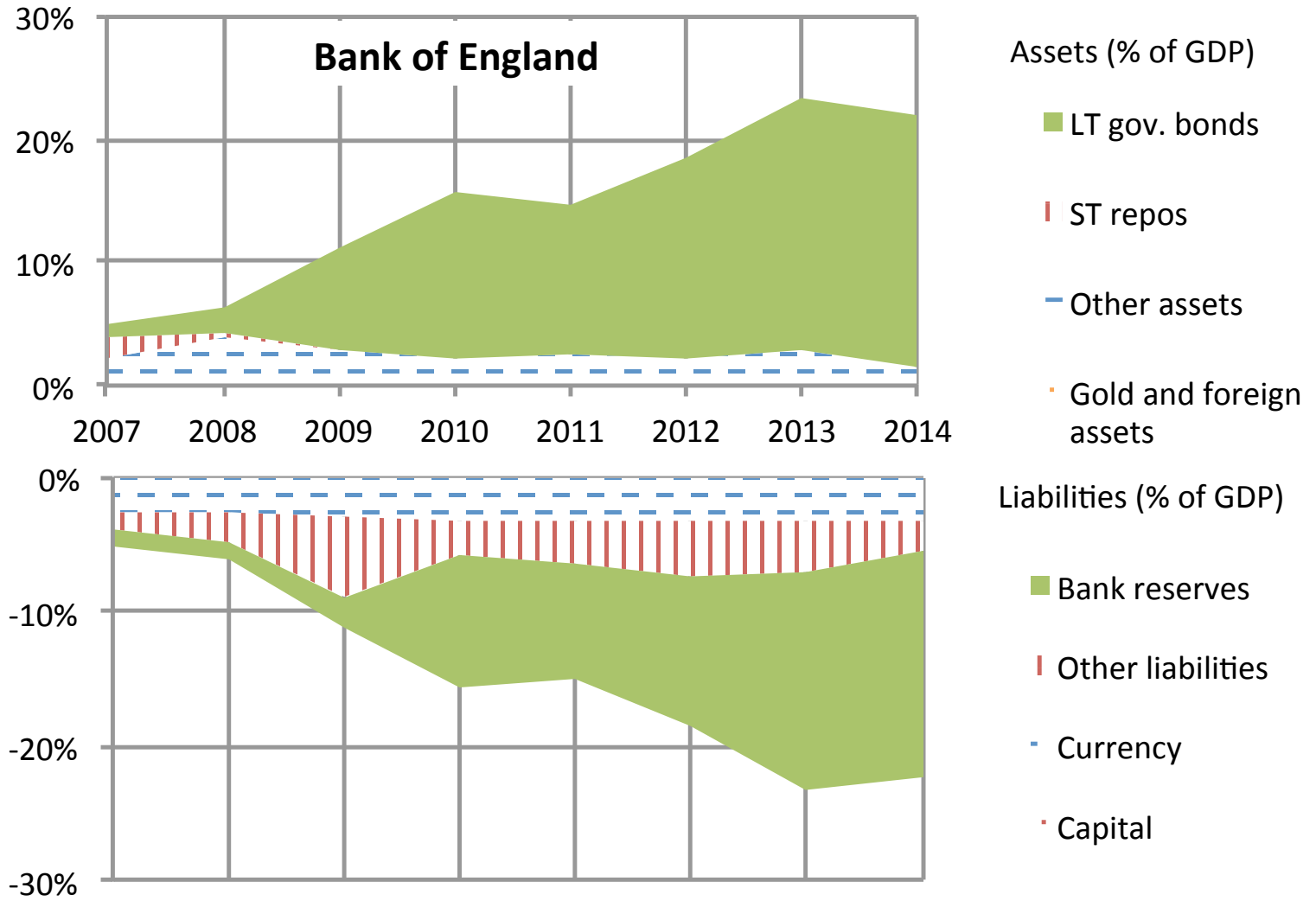
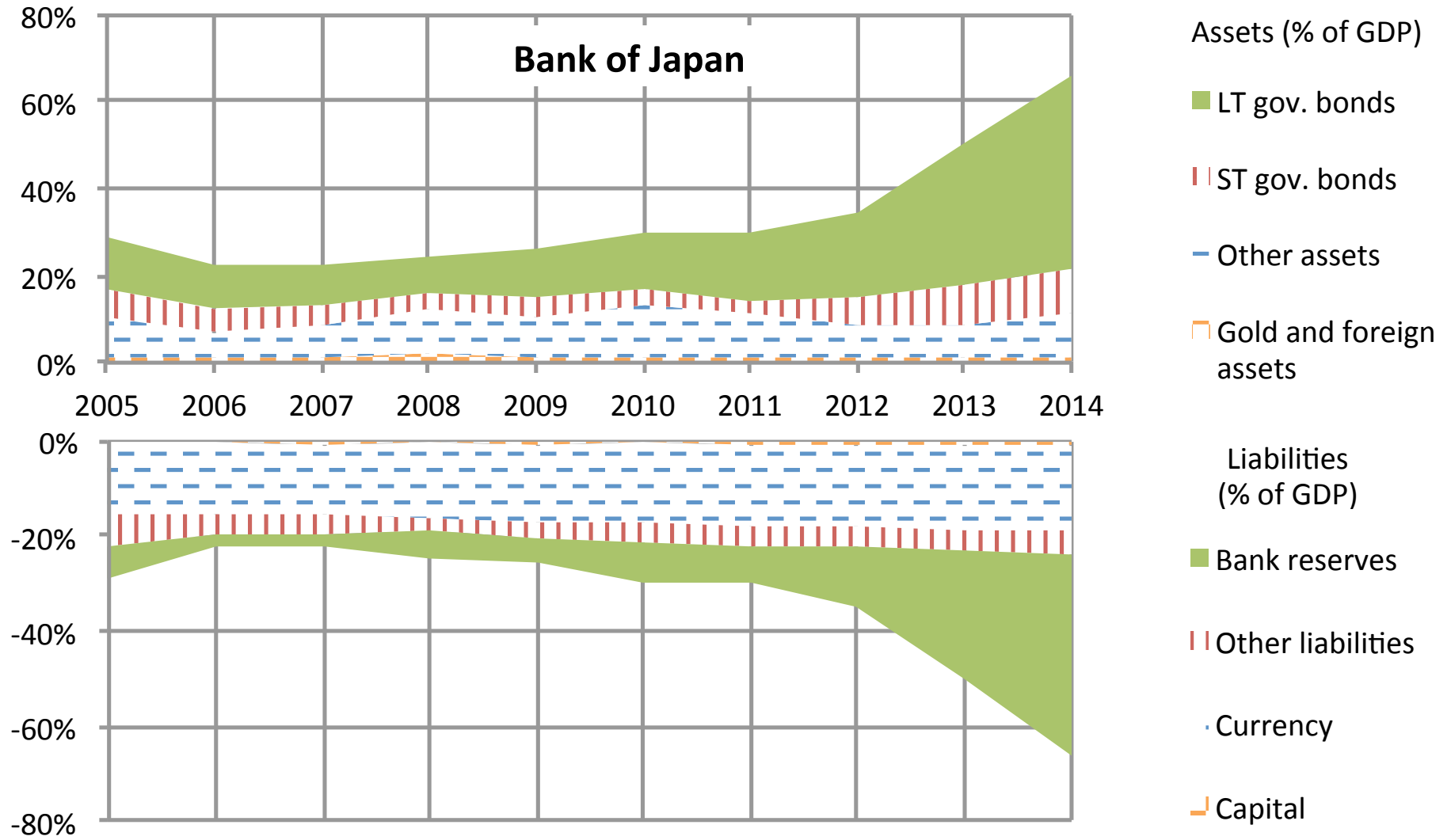


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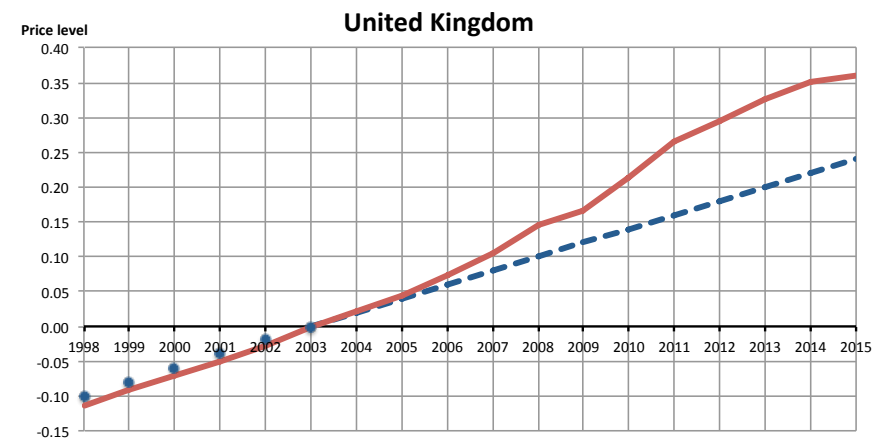
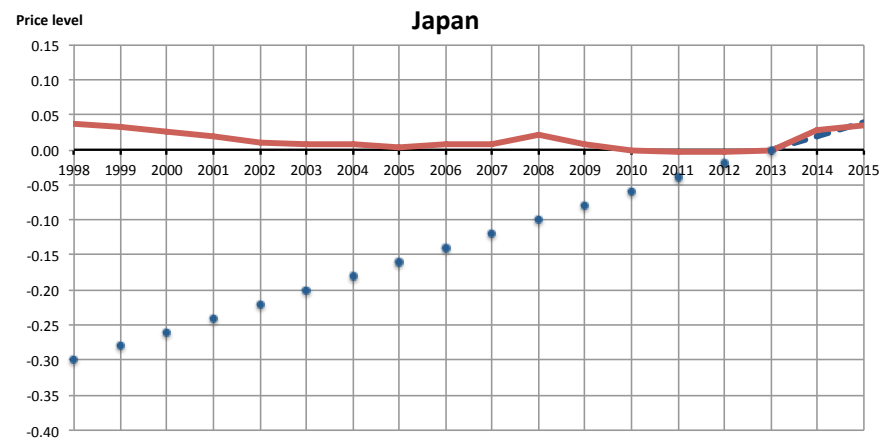
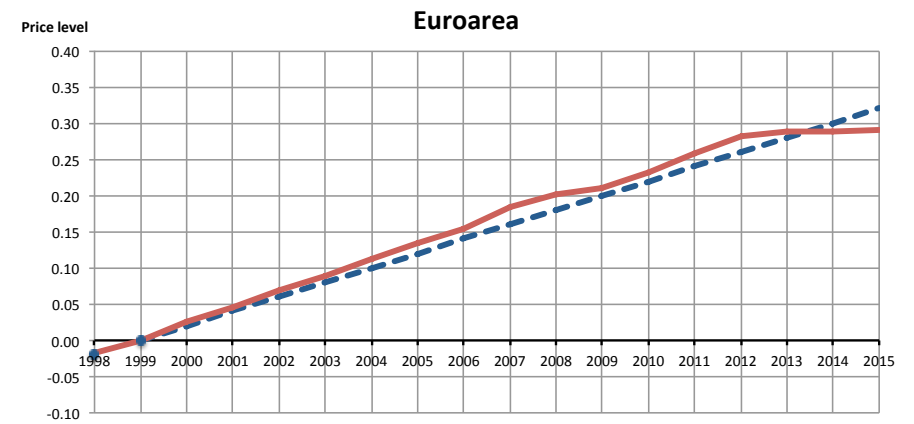
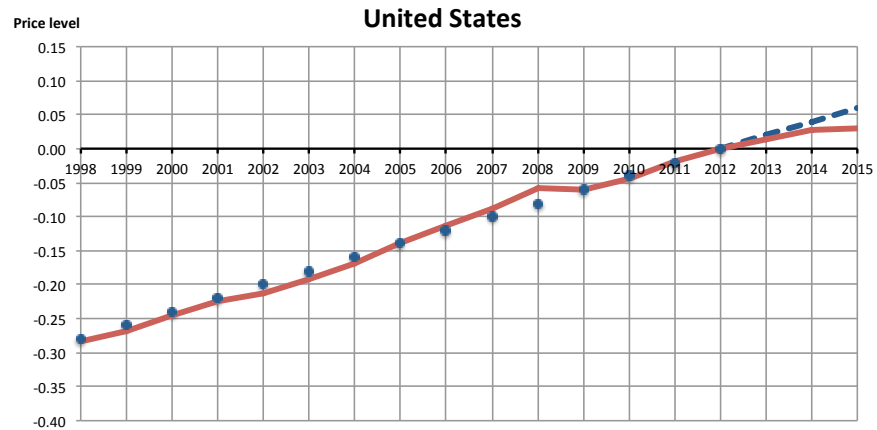


Voluntary interest-paying reserves

Exceptional because:

- historically unprecedented in the United States;
- economically distinct from currency;
- new government asset in banks' portfolio, twice larger weight than Treasuries (2015);
- one of the largest traded securities outstanding with common issuer and maturity;
- monetary policy chooses volume and remuneration

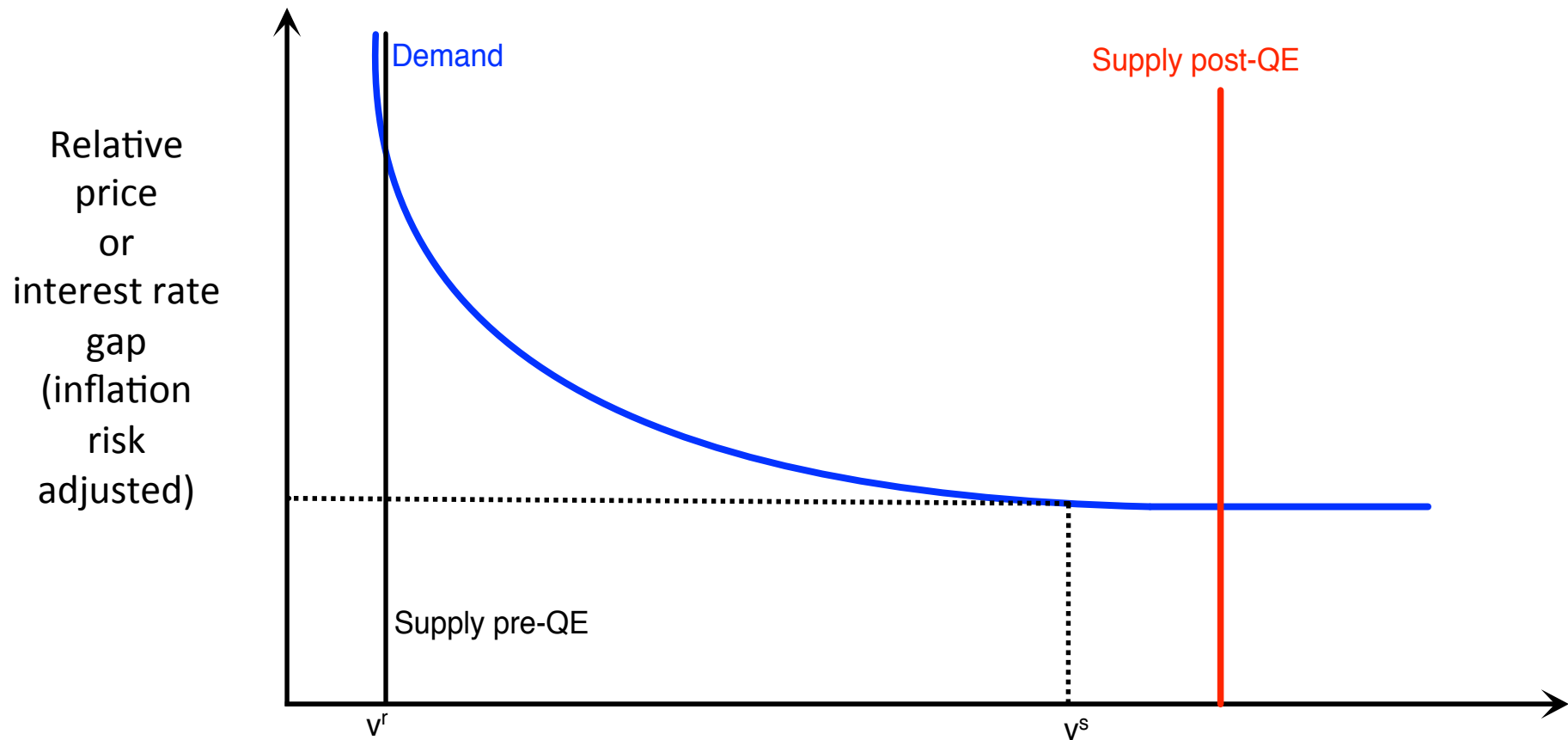
Figure 2. Target and Actual Price Level 1998-2015



Notes: The target price level is in the dashed blue line from the date of the announcement of the target forward, the hypothetical target is the extension of the target backwards in time, and the actual price level is in the solid red line. All are normalized to equal zero at the date of adoption of the target. For the United States, the inflation target was adopted in January of 2012 using the personal consumption expenditures deflator as the reference measure. For the Euroarea, the target was adopted in January of 1999 for the harmonized consumer price index. For Japan, the target for the consumer price index was adopted in January of 2013. For the Bank of England, the current target for the consumer price index target was adopted in December of 2003. The target for all four is a 2% annual growth in the price level. The vertical axis is in a log scale.

1. Market for reserves is saturated

Figure 3. Equilibrium in the market for reserves



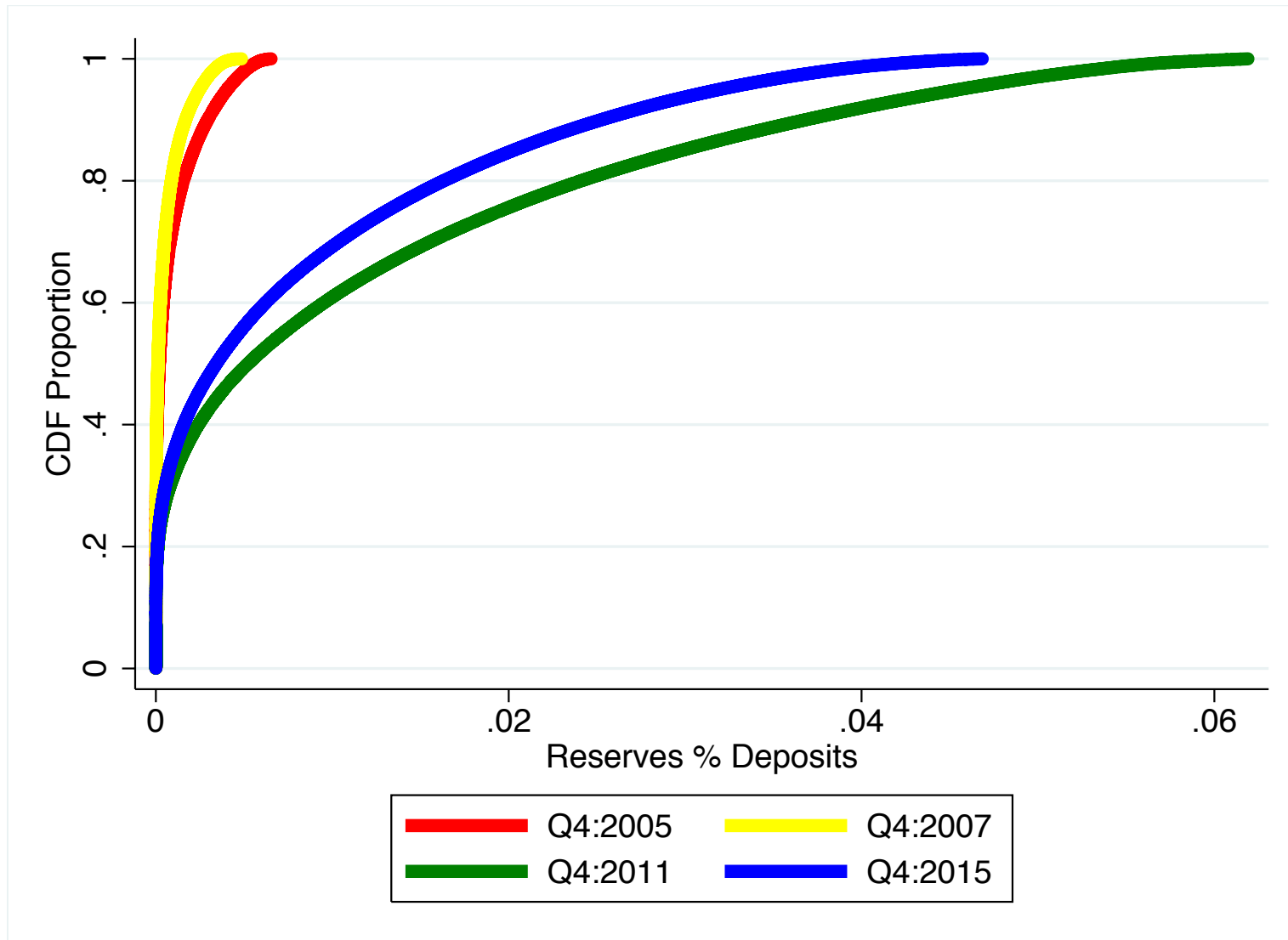
1. Market for reserves is saturated

Variables	(1) Reserves	(2) Reserves	(3) Reserves	(4) Reserves	(5) Reserves	(6) Reserves
$i_{\text{Reserves}} - i_{\text{FederalFunds}}$	-0.174 (0.112)		-0.119 (0.112)		-0.199 (0.127)	-0.467** (0.185)
$i_{\text{Reserves}} - i_{\text{Tbill}}$		0.0140 (0.156)		0.187 (0.162)	0.0878 (0.171)	0.352 (0.219)
Obs	53	53	53	53	53	88
Trend	No	No	Yes	Yes	No	No
F Test	2.40	0.01	1.93	2.40	1.40	3.49**
Adj. R sq.	0.022	0.019	0.033	0.043	0.010	0.087

Notes: The left-hand side in all regressions is the difference in log real reserves. In columns 1 to 5, the sample goes from December 2011 to June 2016; in column 6 it starts in December 2008. A time trend is included in columns 3 to 6. Robust standard errors in parentheses.

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

1. Market for reserves is saturated

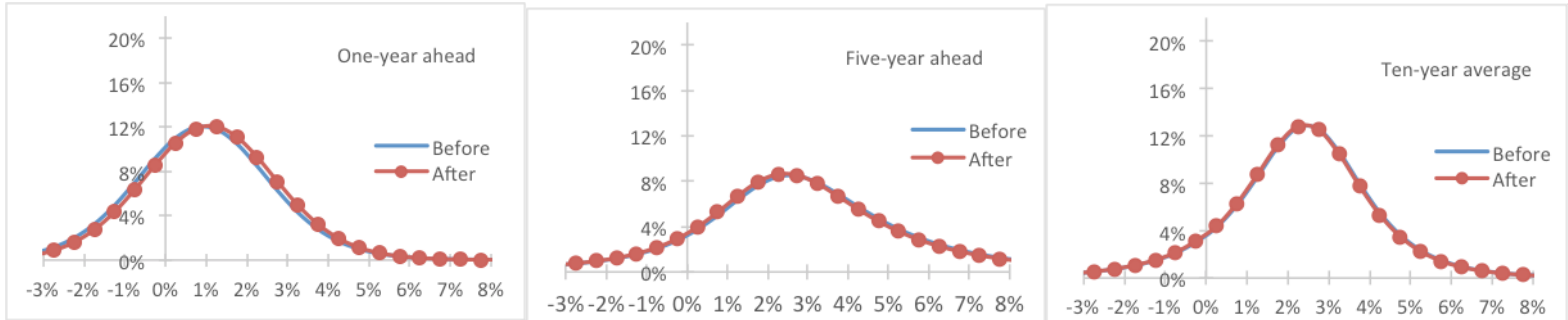


2. Monetary tools and goals

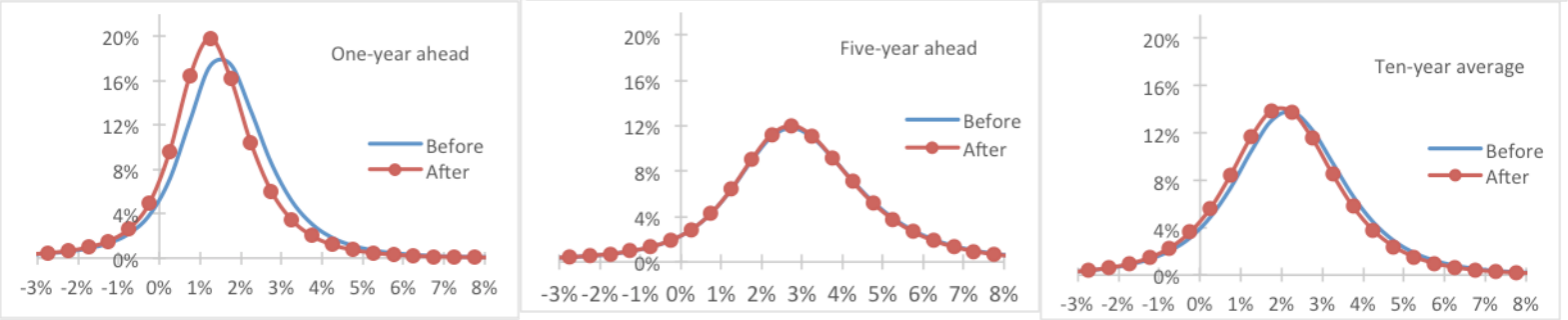
- Because demand for reserves is (close to) horizontal, pinned relative price, then the quantity supplied has approximately no effect on inflation.
- Issuing reserves generates no seignorage revenue.
- Reserves are another form of government liability (Modigliani-Miller-Wallace).

2. I and V are separate instruments

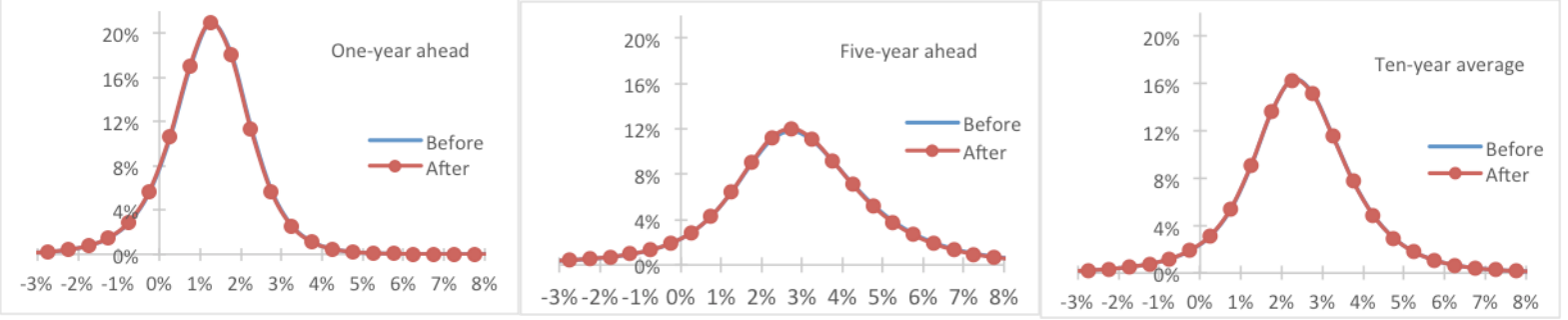
QE2
(3-Nov-10)



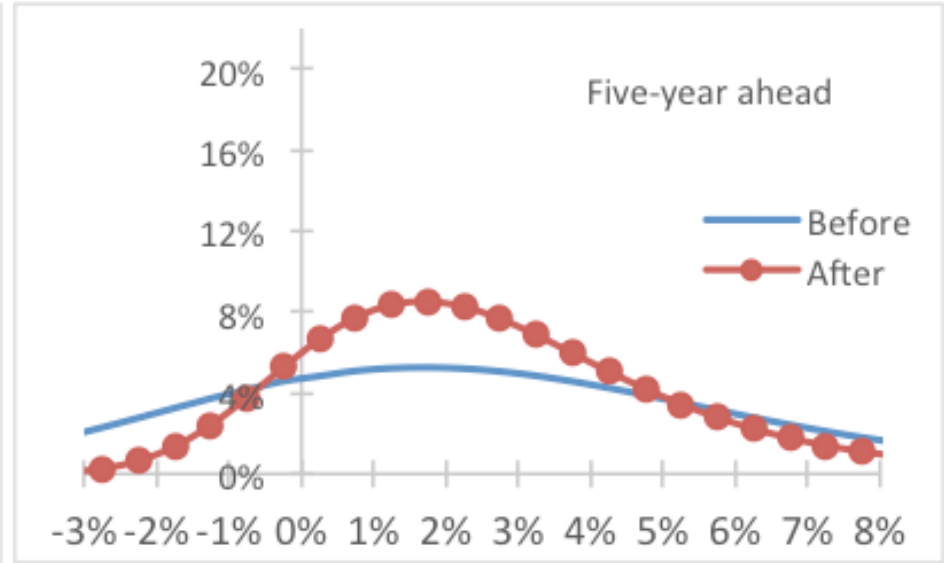
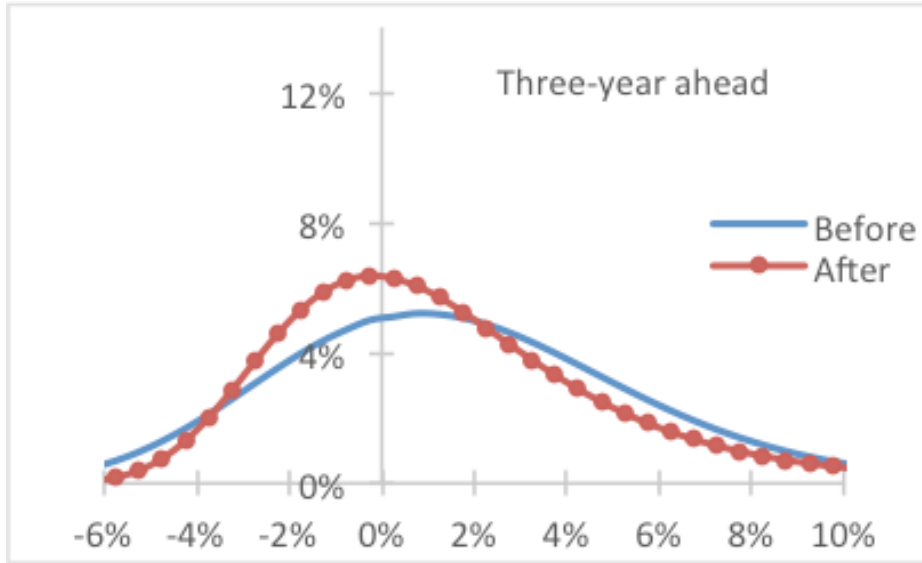
QE3
(21-Sep-11)



QE4
(22-May-13)



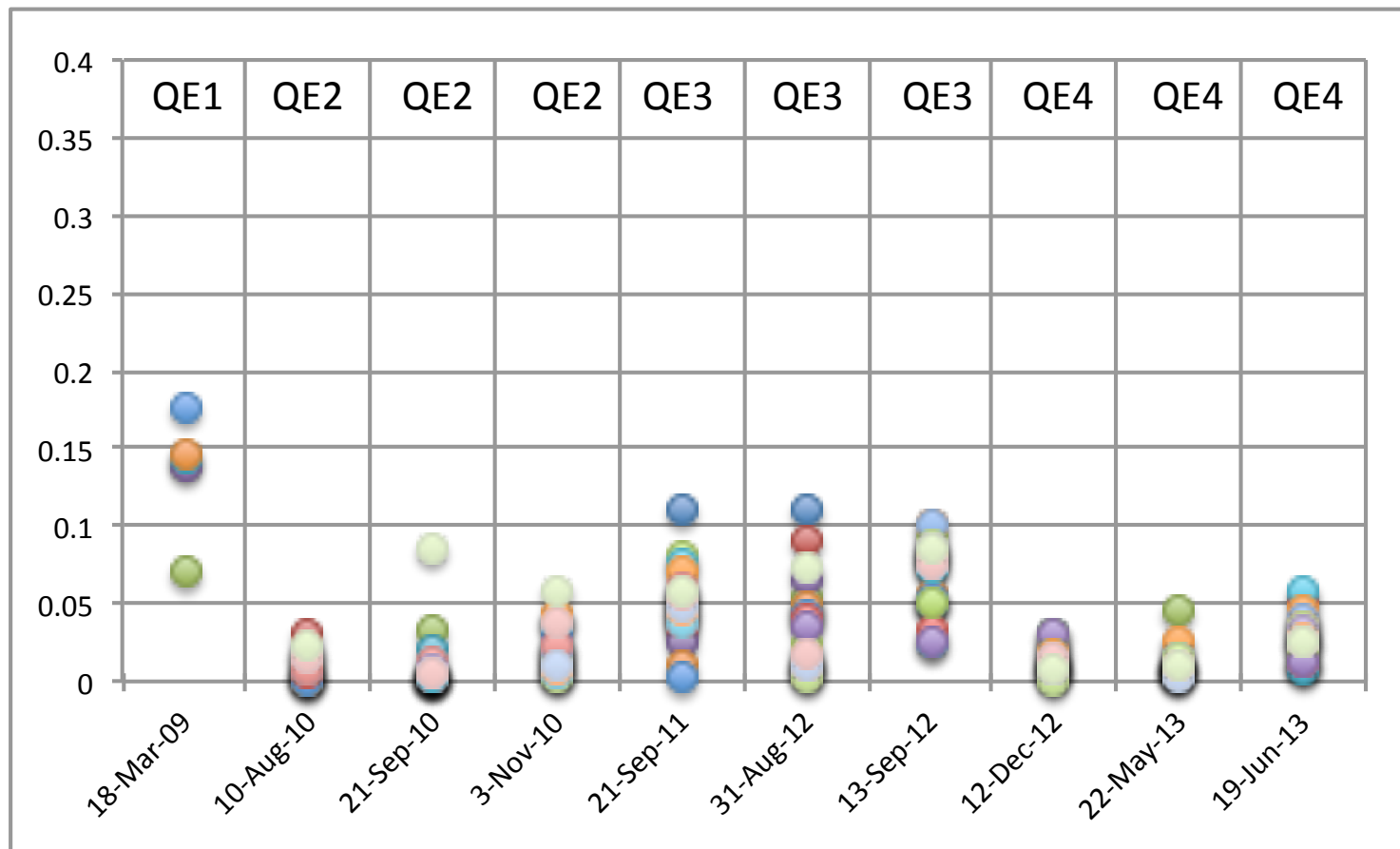
2. I and V are separate instruments only now



QE1
(18-Mar-09)

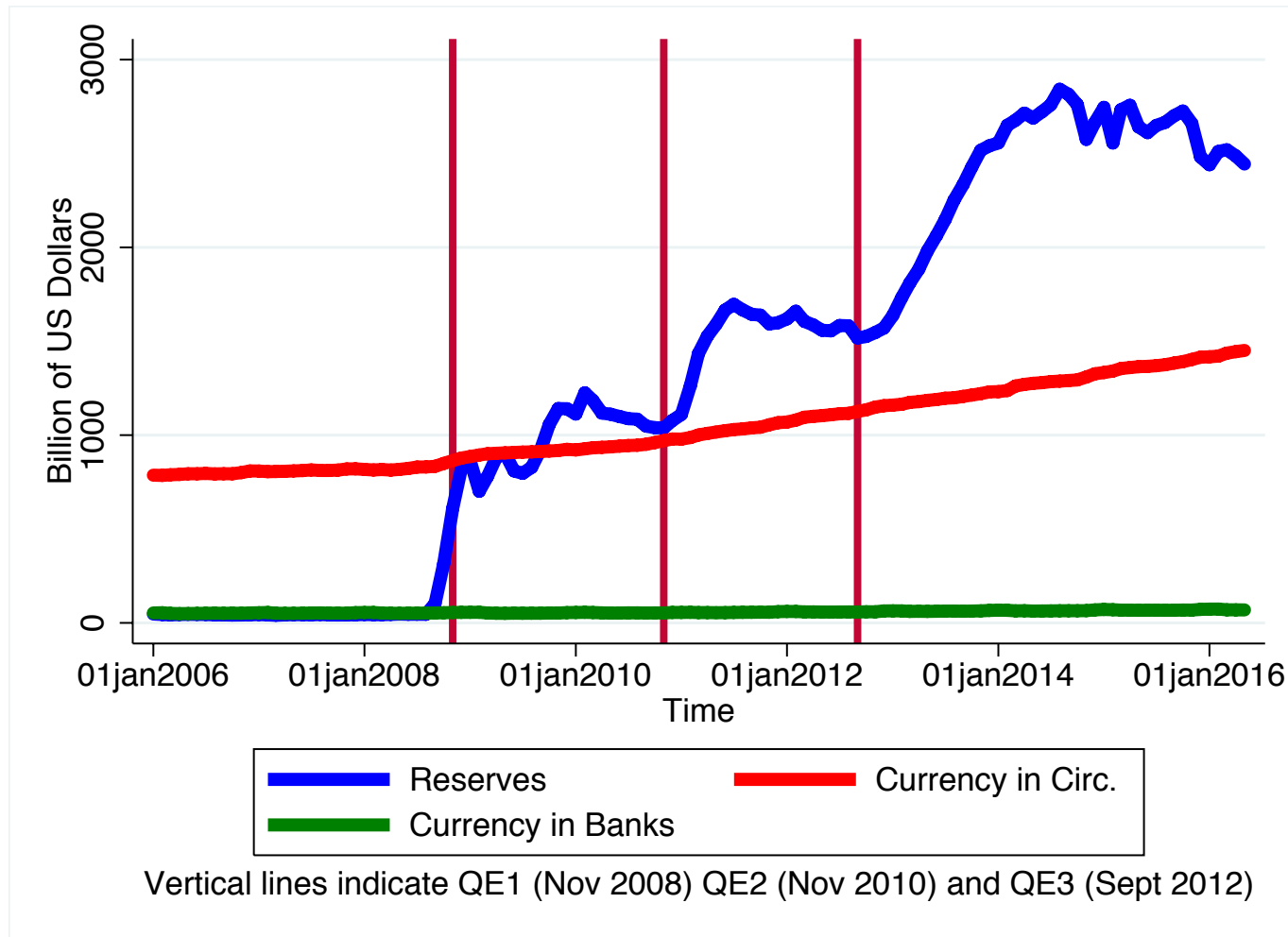
2. I and V are separate instruments

Figure 12. Kolmogorov-Smirnov statistics for a change in the distribution of inflation for all horizons at each QE date



3. Can keep reserves at elevated level?

Figure 4. QE and the liabilities of the Federal Reserve



3. Central bank insolvency

- When issuing reserves becomes a Ponzi scheme, banks no longer want to hold reserves. Their value collapses, hyperinflation ensues. This happens when the fiscal authority does not recapitalize.
- Risks: QE and yield curve.
- Extreme: default risk. Can only rely on the seignorage from printing banknotes to back reserves.

3. Can keep reserves at elevated level

Table 4. The solvency upper bound for QE by the Fed

	Estimation method			
	Partial equilibrium		General equilibrium	
Discounting	Reduced-form	Structural	Reduced-form	Structural
Historical	19.0	16.4	13.8	19.0
Climate-change	25.8	22.5	25.8	18.7
Market-based	32.5	28.4	32.5	23.7

Notes: All numbers expressed as % of GDP

4. Not out of firepower

Keeping focus on **interest rates** and on **deposits at CB**.

Indexed reserves

DEFINITION

A real payment-on-reserves monetary-policy process promises today to pay the holder of a unit of reserves $1 + x_t$ units of output next period; $1 + x_t$ is set in period t .

The market equalizes real return on reserves and on indexed bonds. x_t is a payment, not a return. Value of reserves today must change for reserves to be equated. But that value is the inverse of the price level.

4. Not out of firepower

Keeping focus on **interest rates** and on **deposits at CB**.

Forward reserves

(i) forward guidance: if the central bank announces expected short rates, inflation will deviate from target due to lack of commitment, risk premia, and control errors.

(ii) short-long regime: if the central bank announces targets for both short and long rates, inflation will deviate from target due to risk premia and control errors.

(iii) forward reserves: if the central bank announces forward rates, inflation will deviate from target due to control errors.

5. Use overnight reverse repo

Peculiarities of U.S. market segmentation

Trade-off:

- Raising RRP towards IOR reduces subsidy to banks, increases pass through of monetary policy
- If $RRP=IOR$, then private overnight repo market will close to disappear, lose market signal

Policy conclusions

1. Stay focused on interest rates, rules, forward guidance. But for interest on reserves now (not FFR and adjusting DW and RRP in tandem)
2. Lean balance sheet of Fed is \$2.5tr to keep market saturated with reserves.
3. QE is not an inflation policy. Other goals
4. Radical measures exist if fall into deflation spiral.