Exceptional policies for exceptional times

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Outline

1. Preliminaries
2. Conceptualisation of role played by non-standard central bank measures
3. The ECB experience in practice
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Disclaimer
References

‘Monetary policy in exceptional times,’ EcPol10.
‘The ECB and the interbank market,’ EJ12.
‘Non-standard monetary policy measures and monetary developments,’ ECB WP 1290.
‘Central bank balance sheets as policy tools,’ BIS EP 66.
‘Bank balance sheets in financial crisis,’ mimeo.
‘Non-standard monetary policy measures, monetary financing and the price level,’ mimeo.
‘The quasi-fiscal capacity of the ECB,’ GS EWA 11/35.
Main themes – operating in ‘grey areas’

- Solvency problems
- Fiscal dominance
- Monetary dominance
- Liquidity problems

Central bank role

Govt role
Main themes – operating in ‘grey areas’

- Solvency problems
- Liquidity problems
- Monetary dominance
- Fiscal dominance
- Central bank role
- Govt role

‘Grey area’
Outline

1. Preliminaries
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3. The ECB experience in practice
The financial crisis has led central banks to introduce a variety of non-standard measures:

- ECB – ‘enhanced credit support’, CBPP, SMP, OMT
- FED – ‘credit easing’, QE2, QE∞
- BoE – ‘quantitative easing’, FLS

These appear to have ‘worked’ (at least in the sense of avoiding a financial cataclysm and providing some marginal stimulus to the economy) (e.g. EJ12, ECB WP1290)

… but concerns have been expressed about their longer-term impact on central bank balance sheets and institutional independence as well as on the outlook for price stability
Motivation #2

To clarify two inter-related issues in central banking:

• **Central bank policy instruments**
  
  Monetary policy (interest rate level, stock of ‘reserves’)
  Interest-on-reserves policy (liquidity management)
  Credit policy (composition of central bank asset holdings)

  ⇒ risk of (quasi-) fiscal activities of central banks …

  Goodfriend (2012): “the correct way to think of central bank credit policy is a debt-financed fiscal policy”

• **Institutional considerations**
  
  FED / Treasury Accord
  Prohibition of monetary financing (*Art. 123 of Lisbon Treaty*)
Textbook definitions

Quantitative easing

Qualitative easing / Credit easing

Source: EcPo110
Motivation #3

To explore the relationship between two (non-exclusive) lines of research into the relationship between monetary and fiscal policies:

• **Monetarist**
  Money supply driven by fiscal factors
  Money created in excess of money demand
  Cagan model of hyperinflation

• **Fiscal theory of the price level**
  Government does not respect inter-temporal budget constraint
  Government cannot default
  In general equilibrium, fiscal considerations can drive price developments
Concerns among academics …

Hamilton (2009)

“every hyperinflation in history has two ingredients … a fiscal debt for which there was no politically feasible ability to pay with tax increases or spending cuts [and] a central bank that was drawn into the task of creating money as the only way to meet the obligations that the fiscal authority could not”
... and among policy makers

Jens Weidmann (Bundesbank)

“Laufen die Staatsfinanzen aus dem Ruder, kann auch der Druck auf die Notenbank übermächtig werden, der Fiskalpolitik zur Seite zu springen – und im Gegenzug ihr Hauptziel Preisstabilität zu korrumpieren.”

Narayana Kocherlakota (FRB Minneapolis)

“The concern is that if you go down this path, [then] you'll see realizations of inflation that will trigger a lack of trust in the central bank's ability or willingness to keep that target. The cost you suffer is the loss of trust.”
Anticipation of results ...

- Non-standard central bank measures embody two elements:
  - ‘pure’ liquidity measures;
  - credit measures (= quasi fiscal measures)

- Viewed from the longer-term perspective in terms of implications for price stability:
  - liquidity measures are benign (but they should be standard rather than non-standard element of policy);
  - credit measures:
    - can support (indeed, may be necessary to achieve) price stability;
    - but entail potential risks if not limited in scope and/or duration.
Simple model

- General equilibrium
- 3 actors in the economy
  - Private sector (households that own firms);
  - Central bank
  - Government
- In this exercise, we focus on the steady state
Household #1

Maximise utility subject to intertemporal budget constraint

\[
\max_{c, h, m, B^p, L^{cb}} \mathbb{E}_0 \sum_{t=0}^{\infty} \beta^t U(c_t, h_t, m_t) = \sum_{t=0}^{\infty} \beta^t \left[ u(c_t) - f(h_t) + \eta L \left( \frac{m_t}{m} \right) \right]
\]

subject to:

\[
\left( \frac{W_t}{p_t} - \tau_t \right) + R_{t-1} \frac{B^p_{t-1}}{p_t} + \frac{L^{cb}_t}{p_t} + i_{t-1} \frac{m_{t-1} p_{t-1}}{p_t} + \frac{D_t}{p_t} \geq (c_t + m_t) + \frac{B^p_t}{p_t} + R_{t-1} \frac{L^{cb}_{t-1}}{p_t}
\]

Household budget constraint
Household #2

• Pins down real interest rate in steady state:

\[ \beta = \frac{\bar{\pi}}{\bar{R}} \]

• Separability in period utility function yields recursive demand for reserves, with satiation:

\[ m_t = m(c_t, \mu_t, \bar{m}, \eta) \]

\[ m_c > 0, \ m_{\mu} \leq 0, \ m_{\eta} > 0; \]

\[ \bar{m} \leq m(c_t, 0; \bar{m}, \eta) \]

\[ \mu_t = \frac{(R_t - i_t)}{R_t} \geq 0 \]

‘spread’ between reserve remuneration and market rates
Firm

- Standard New Keynesian set-up
- Pins down output
- Negative relationship with steady state inflation rate
Central bank #1

**Assets:** Government bonds, loans to private sector

**Liabilities:** Reserves

\[ m_t \rho_t = B_{cb}^t + L_{cb}^t \]

Seigniorage function

\[ \psi_t = \frac{R_{t-1} (B_{t-1}^{cb} + L_{t-1}^{cb})}{\rho_t} - (i_{t-1}) m_{t-1} \frac{p_{t-1}}{\rho_t} \]
Central bank #2

Holdings of reserves are voluntary (≠ Cagan / monetarist)

Seigniorage ‘Laffer curve’, with maximum revenue level

\[
\psi_t = \frac{R_{t-1} \left( B_{t-1}^{cb} + L_{t-1}^{cb} \right)}{p_t} - (i_{t-1}) m_{t-1} \frac{p_{t-1}}{p_t}
\]

\[\psi^*_t = \psi^* (c_{t-1}; \bar{m}, \eta)\]
Government expenditure is given exogenously, according to the mechanics …

- In period $t-1$, the private sector “buries” $g_{t-1}$ of available final consumption good
- The government is presented with a ‘bill’ for these resources at the end of the period in nominal terms,
  \[ G_{t-1} = g_{t-1} p_{t-1} \]
- The government meets this bill during the next period, implying a real cost of $g_{t-1} p_{t-1}/p_t$
- Crucially, there is scope to erode the real value of this payment via inflation
So ‘government’ should be understood as encompassing the creators of (implicit) liabilities in the private sector …

From an empirical point of view, this dramatically increases the potential costs …
Government balance sheet evolves according to …

\[
\frac{B_t}{p_t} = \frac{(R_{t-1}) B_{t-1}}{p_t} - \left( \tau_t - \frac{g_{t-1} p_{t-1}}{p_t} \right) - \psi_t
\]

… so that in a balance sheet consolidated version perspective (fusing the CB and government accounts), the real debt evolves according to developments in new spending and revenues (including seigniorage)
Government #4

Where (real) ‘conventional’ lump-sum taxation is subject to an upper bound (‘fiscal limit’) …

\[ \tau_t \leq \bar{\tau} \quad \forall t \]

owing to Laffer curve and / or political constraints …
Fiscal limits are not an abstraction

“many countries in the industrial world have reached the limits of fiscal expansion. ... governments cannot live beyond their means forever”

President J-C. Trichet, 9 July 2010

“Never again will the American taxpayer be held hostage by a bank that is too-big-to-fail”

President B. Obama, 21 January 2010
Consolidated public sector balance sheet

\[
\frac{B_t}{p_t} = \frac{R_{t-1} B_{t-1}}{p_t} - \left( \tau_t - g_{t-1} \frac{p_{t-1}}{p_t} \right) - R_{t-1} \frac{p_{t-1}}{p_t} m_{t-1} \mu_{t-1}
\]

- Because of the various technical and political constraints facing policy makers:
  - The government itself is not optimising;
  - The public sector may behave in a non-Ricardian way.
Key components of the steady state

- Must meet the (real) interest burden of outstanding stock of government debt …
  \[ \frac{(1 - \beta)}{\beta} \sim b \]

- out of primary balance …
  \[ (\tau_t - \frac{g_{t-1}}{p_{t-1}}) \frac{p_{t-1}}{p_t} \]

- plus seigniorage …
  \[ \psi_t \]
Regime #1 – Monetary dominance

\[ \frac{(1 - \beta)}{\beta} \sim b \]

\[ \psi^* \]

\[ \mu^* \]

\[ \tau - g \]

Seigniorage Laffer curve
Regime #1 – Monetary dominance

- Conventional taxation is able to meet all fiscal demands (and adjusts passively to do so) …

\[ \tau \geq \tilde{g} + \frac{(1 - \beta)}{\beta} \tilde{b} \]

- Steady-state inflation rate is determined by the central bank

\[ \pi^* = 1 \]

- Central bank satiates demand for reserves

\[ m_t \geq \overline{m}, \quad \mu_t = 0 \]
Regime #2 – Fiscal dominance

\[ \frac{(1 - \beta)}{\beta} \sim b \]

\[ \bar{\tau} - g \]

\[ \bar{\tau} - \frac{g}{\bar{\pi}} \]

\[ \psi^* \]

Seigniorage
Laffer curve

spread

revenue
Regime #2 – Fiscal dominance

- Fiscal capacity insufficient to meet needs …

\[ \hat{g} \geq \bar{\pi} + \psi^*((\bar{y} - \hat{g}), \bar{m}, \eta) + \frac{(\beta - 1)}{\beta} \hat{b} \]

- Steady-state inflation rate is determined by fiscal / general equilibrium considerations and is not consistent with price stability

\[ \hat{\pi} = \frac{\hat{g}}{[\bar{\pi} + \psi^*((\bar{y} - \hat{g}), \bar{m}, \eta) + \frac{(\beta - 1)}{\beta} \hat{b}]} \geq 1 \]

- Central bank ‘trades off’ higher inflation against liquidity provision
Regime #3 – ‘Grey area’ between monetary and fiscal dominance over the price level

\[
\frac{(1 - \beta)}{\beta} \sim b
\]

\[
\psi^*
\]

\[
\mu
\]

\[
\mu^*
\]

Seigniorage Laffer curve

\[
\tau - g
\]
Regime #3 – ‘Grey area’ between monetary and fiscal dominance over the price level

- To meet needs, reliant on seigniorage …

\[ \bar{\tau} \leq \frac{\bar{g}}{\pi^*} - \frac{(\beta - 1)}{\beta} \bar{b} \leq \bar{\tau} + \psi^*((\bar{y} - \bar{g}), \bar{m}, \eta) \]

- Central bank can maintain price stability …

\[ \pi^* = 1 \]

- … but only by accommodating fiscal demands on its balance sheet (hence up to its own financial resources)
Efficacy of non-standard measures

Liquidity measures are benign

Central bank should always satiate private demand for liquidity since it is a ‘good’ that can be produced costlessly (*Friedman rule*)
Efficacy of non-standard measures

‘Credit policy’ measures are effective because of their (quasi) fiscal nature:

They can support (may even be necessary to maintain) price stability …

- provide a ‘buffer’ when fiscal limits are reached;
- can subsidise ‘necessary activities’ for monetary policy transmission when the scope for explicit / conventional fiscal support is limited by practical and/or political constraints.

But there are limits: when these reached, there are consequences in terms of outlook for price stability
Efficacy of non-standard measures

What could such (non-inflationary) limits be?

Net Present Value (NPV) of current and future profits made by the central bank

\[ S = \left( \frac{1 + i}{1 + i - (1 + \pi)(1 + \gamma)\alpha} \right) \left( (1 + \pi)(1 + \gamma)^\alpha - 1 \right) C_0 \]

When assuming a long-run currency demand function of the type:

\[ \frac{C}{P} = kY^{\alpha}e^{-\beta(i - i^c)} \]
# Numerical examples …

<table>
<thead>
<tr>
<th>Central Bank</th>
<th>NPV of Seigniorage $\alpha = 0.5$</th>
<th>NPV of Seigniorage $\alpha = 1$</th>
<th>Fiscal Stance (end-2011)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ECB</strong></td>
<td>EUR 1.4 tn</td>
<td>EUR 2.5 tn</td>
<td>EUR 6.3 tn</td>
</tr>
<tr>
<td><strong>FED</strong></td>
<td>USD 1.5 tn</td>
<td>USD 2.7 tn</td>
<td>USD 11.0 tn</td>
</tr>
<tr>
<td><strong>BoJ</strong></td>
<td>JPY 142 tn</td>
<td>JPY 259 tn</td>
<td>JPY 612.6 tn</td>
</tr>
<tr>
<td><strong>BoE</strong></td>
<td>GBP 67 bn</td>
<td>GBP 122 bn</td>
<td>GBP 1.2 tn</td>
</tr>
</tbody>
</table>

With $\gamma = 1\%$, $\pi = 2\%$ and $i = 4\%$.

Source: IMF *World Economic Outlook*, GS EWA 11/35
Political economy of non-standard measures

• Non-standard measures:
  -- tax liquidity users (= ‘money holders’)
  -- subsidise beneficiaries of government spending (e.g. insolvent banks).

• Within the Euro area, there is an additional cross-country dimension to these redistributive effects:
  -- geographical location of taxed and beneficiaries of non-standard
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1. Preliminaries
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Transmission mechanisms of non-standard central bank measures

• Portfolio balance effects influencing yield structure
• Central bank intermediation of dislocated markets
Fact #1 – Euro area is bank centric

Share of bank loans in external debt financing of non-financial corporations

Source: ECB
Fact #2 – Size of central bank balance sheets

Source: Federal Reserve, Bank of England, ECB
Fact #3 – Rise in wholesale funding

Source: ECB
Fact #4 – Lengthening of intermediation chains

Source: BIS EP 66
Implications #1

• To support flow of credit to the real economy, ECB has to operate largely through banks

• In comparing with others CBs, need to keep in mind starting point (and scope for changing structure rather than expanding balance sheet)

• The key source of funding for European banks is the wholesale market – this focuses attention on interbank transactions and flows
Diagnosis of the crisis

• ‘Lehman shock’ – large financial institutions can go bankrupt.

• Uncertainty / asymmetric information regarding impact of sub-prime (and other complex financing) on strength of bank balance sheets.

• Market seizes up as ‘trust’ in creditworthiness of counterparties evaporates (Heider et al., 2011) …
  -- Part of this is ‘market failure’ owing to adverse selection
  -- Part of this owes to genuine default risk
  -- Hard to distinguish and anyway interaction is endogenous – there is another ‘grey area’
    “An illiquid bank is an insolvent bank”
Banking systems in the periphery ‘red-lined’ as Euro markets segment

Pre-Lehman, Euro interbank markets were highly integrated

With the financial crisis, segmentation has emerged

cross-border bank claims as a percentage of lending country GDP, 2008 Q1
cross-border bank claims as a percentage of lending country GDP, 2012 Q1

<table>
<thead>
<tr>
<th></th>
<th>Ger</th>
<th>Ned</th>
<th>Fra</th>
<th>Ita</th>
<th>Spa</th>
<th>Por</th>
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<td>37.8%</td>
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<td>Por</td>
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<td>Ire</td>
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<td>82.7%</td>
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<td>0.2%</td>
<td>0.1%</td>
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<td></td>
</tr>
</tbody>
</table>

Source: BIS, GS Global ECS Research
Fact #4 – Lengthening of intermediation chains

Source: BIS EP 66
Response – Central bank intermediation

Saver

A

Bank 1

recourse to deposit facility

ECB
BALANCE SHEET

borrowing at repo operations

Bank n

B

Borrower

Source: BIS EP 66
Substitution of bank financing of periphery with financing across central bank balance sheet

Source: ECB, Bundesbank
Implications #2

• Central bank intermediation can substitute for interbank transactions so as to maintain flow of credit to real economy.

• Substitution will be less than one-for-one: need not imply shortcoming of policy action.

• Judge success of operation in terms of extent to which ‘normal’ credit flows are supported in dysfunctional market environment.
Data #1

- Exploit little used time series …

- **Consolidated** MFI balance sheet
  - basis for monetary aggregates
  - nets out interbank positions (by construction, equal zero)

- **Aggregate** MFI balance sheet includes gross interbank positions

- Separately identify Eurosystem within MFI sector
Data #2

- **Macroeconomic time series (11)**
  - Industrial production, unemployment, HICP, PPI
  - EURIBOR, yield curve, equity prices
  - US IP, CPI, policy rate

- **MFI balance sheet variables (17)**
  - Loans and deposits vs. domestic sectors
  - Interbank loans and deposits
  - Positions with Eurosystem
  - Capital

- **28 monthly variables, Jan 1999 to April 2011**
Empirical approach #1

Counterfactual analysis:


2. Forecast balance sheet variables conditionally on the estimated parameters, past variables and realization of business cycle data until end of the sample in April 2011 (so focus of these exercises is on the ‘post-Lehman’ period, not subsequent actions).
3. **Ask:** What should we expect about balance sheet behaviour given business cycle conditions? Is what we observe significantly different?

4. **Interpretation:** The conditional forecast can be interpreted as an impulse response to a combination of shocks that explain the bulk of the business cycle.

5. **Conclude:** If observed times series move in line with conditional forecast, then policy measures have offset impact of the financial market dislocations.
The ‘curse of dimensionality’

Large information set:

28 time series variables

plus

unconstrained model with rich dynamics – VAR in levels, 13 lags

• Estimation uncertainty makes the model unstable/unreliable
• Need to limit variability owing to estimation error
Bayesian ‘shrinkage’

Mixed estimation

\[
\begin{align*}
\text{Data} & \quad + \quad \text{Prior} \\
\text{(Complex / Rich)} & \quad \text{(Parsimonious / Naïve)}
\end{align*}
\]

- Stable and reliable estimation of complex model if data co-move (as typically macroeconomic data)
- Co-movement: sample information in all variables ‘massively points in the same direction’ against the prior

De Mol, Giannone and Reichlin (2008)
Banbura, Giannone and Reichlin (2010)
Behaviour of bank assets

*EUR tr*

Source: ‘Bank balance sheets in financial crisis,’ *mimeo.*
 Behaviour of bank assets

Loans to non-financial corporations held up well relative to the counterfactual

Behaviour of bank assets

Source: ‘Bank balance sheets in financial crisis,’ *mimeo.*
But it is credit to (extra-Euro area) non-residents that suffer most.

Behaviour of bank liabilities

Behaviour of bank liabilities

Market funding is difficult

Behaviour of bank liabilities

Short-term financing from wholesale sources is weak

Behaviour of bank liabilities

Financing from Eurosystem rises (but less than 1-for-1)

Substitution of interbank market with central bank intermediation

Financing from Eurosystem

%age of total intra-MFI liabilities

Source: ‘Bank balance sheets in financial crisis,’ *mimeo.*
Empirical approach  #3

- Construct measure of central bank intermediation
- Run counterfactual experiment through estimated model with the constructed measure
- Compare this counterfactual with the base estimation of the model
- Difference between the two counterfactuals is (loosely speaking) an ‘impulse response’ to the policy innovation as interpreted by the model
Constructed measure of ‘policy shock’

Source: EJ12
## Impact on key macro variables

*pr (“outcome worse” without non-standard policy)*

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<tr>
<th></th>
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<tbody>
<tr>
<td>Industrial production</td>
<td>0.53</td>
<td>0.67</td>
<td>0.72</td>
<td>0.66</td>
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<td>Unemployment</td>
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<td>Loans to MFIs</td>
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<td>0.64</td>
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<td>Long-term loans to HHs</td>
<td>0.55</td>
<td>0.70</td>
<td>0.73</td>
<td>0.66</td>
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<td>Eurosystem liquidity</td>
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<td>0.95</td>
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<tr>
<td>Wholesale funding</td>
<td>0.56</td>
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<td>0.55</td>
<td>0.58</td>
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</table>

**Notes.** The acronyms in the Table are NFCs (non-financial corporations), HHs (households), MFIs (monetary and financial institutions), OFIs (other financial institutions), ICPF (insurance companies and pension funds), MMFs (money market funds). Values refer to the probability of observing a positive impact associated to Eurosystem policy.

Source: EJ12
**Impact on key macro variables**

**Source:** EJ12

**pr (“outcome worse” without non-standard policy)**

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<td><strong>Eurosystem liquidity</strong></td>
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<td><strong>0.95</strong></td>
<td><strong>0.88</strong></td>
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<tr>
<td>Wholesale funding</td>
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</table>

**Financing from Eurosystem clearly ‘exceptionally’ high**

**Notes.** The acronyms in the Table are NFCs (non-financial corporations), HHs (households), MFIs (monetary and financial institutions), OFIs (other financial institutions), ICPFfs (insurance companies and pension funds), MMFs (money market funds). Values refer to the probability of observing a positive impact associated to Eurosystem policy.

**Source:** EJ12
Impact on key macro variables

pr ("outcome worse" without non-standard policy)

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<tr>
<td>Industrial production</td>
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<td>0.67</td>
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</tr>
<tr>
<td>Unemployment</td>
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<td>Loans to MFIs</td>
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<tr>
<td>Loans to OFIs + ICPEs + Non-resident + MMF</td>
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</tr>
<tr>
<td>Short-term loans to NFCs</td>
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<td>0.73</td>
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*Notes.* The acronyms in the Table are NFCs (non-financial corporations), OFIs (other financial institutions), MMFs (money market funds). Values refer to the months indicated, and reflect the impact associated to Eurosystem policy.

Source: EJ12

Loans more resilient (especially to non-financial corporations)
Impact on key macro variables

pr ("outcome worse" without non-standard policy)

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Source: EJ12
Macroeconomic impact of measures

Percentage deviation from base, percentage points

- Industrial production
- Unemployment
- HICP inflation
- Short-term loans to non-financial corporations

Source: EcPol10
Sovereign markets face similar challenges, forcing ECB into its new OMT programme

Foreigners have pulled back from the Spanish sovereign debt market…

… leading sovereign spreads to gap relative to fundamentals

Spanish and Italian 10-year sovereign yields are elevated …

… but it is spikes in the 2-year rates that bring system to a halt

Source: ECB, Reuters, GS Global ECS Research
Concluding comments #1

• ECB non-standard measures have focused on providing central bank intermediation of dysfunctional markets
• Evidence of substitution of such intermediation for interbank markets post-Lehman, with anticipated characteristics
• This has had a supportive effect on bank and macroeconomic activity
Concluding comments #2

• … but this has certainly entailed provision of subsidies to the beneficiary banks

• It has facilitated ‘ever-greening’ of bad loans and delayed necessary restructuring / consolidation

• It also entails risks of fiscal dominance if not contained in time and scope