Forecasting GDP and inflation in EMU and Spain

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Introduction

- At BBVA Research we use different methodologies and models for forecasting GDP growth and inflation, from univariate time series and dynamic factor models to GVAR and DSGE models.

- In this presentation I will discuss the **details of two of those models**:
  - **MICA-BBVA**: Dynamic Factor Model for the short-term forecasting of **GDP growth**
  - **Trimmed mean inflation** for the medium-term forecasting of **inflation**

- **MICA-BBVA** has been extensively used, with very good results:
  - **Spain, EMU**, USA, Mexico, Portugal, Argentina, Venezuela and the world economy
  - Aggregate demand components (private consumption)

- **Trimmed mean inflation** has been applied to:
  - Japan, to study its ability to forecast deflation
  - **EMU and Spain**, to have a better understanding of price dynamics in context of low inflation expectation for and extended period of time
Index

1. MICA-BBVA for short-term forecasting of GDP, with results for Spain and EMU

2. Trimmed mean inflation for Japan, EMU and Spain
1. MICA-BBVA

Introduction

- **Early assessment of economic activity** is crucial for governments and central banks, financial institutions, consumers...

- Generally accepted: **GDP growth rate**

- But statistical agencies publish GDP with about 1-2 months **delay**

- Typical solution: **economic indicators**
  - Shorter publication delay
  - Track GDP economic fluctuations

- In **EMU and Spain** GDP forecasting is specially problematic
  - Long publication delay
  - Presence of missing values in the historical time series
  - Short length of some indicators.
1. MICA-BBVA

Introduction

**Distinctive features of MICA-BBVA:**

  - Camacho and Pérez-Quiros (2011) use EMU GDP since 1995
  - Camacho and Sancho (2003) use IPI
- MICA-BBVA includes **financial indicators**
  - In Camacho and Pérez-Quiros (2011) they are non-significant
  - Wheelock and Wohar (2009): do financial series lead growth rate?
  - We have found that some financial indicators lead the business cycle
- **Examines forecasting accuracy** in pseudo-real time
## 1. MICA-BBVA

### Variables in the model for Spain

<table>
<thead>
<tr>
<th>Series</th>
<th>Effective Sample</th>
<th>Source</th>
<th>Publication delay</th>
<th>Data transformation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Real GDP (GDP)</td>
<td>2Q80-1Q14</td>
<td>INE</td>
<td>1.5 months</td>
<td>SA, QGR</td>
</tr>
<tr>
<td>Real credit card spending (CCS)</td>
<td>1M02-6M14</td>
<td>BBVA based on Servired &amp; INE</td>
<td>0 months</td>
<td>SA, AGR</td>
</tr>
<tr>
<td>Consumer confidence (CC)</td>
<td>6M86-5M14</td>
<td>European Commission</td>
<td>0 months</td>
<td>SA, L</td>
</tr>
<tr>
<td>Real wage income (RWI)</td>
<td>1M81-5M14</td>
<td>BBVA based on MEC &amp; INE</td>
<td>1.5 months</td>
<td>SA, AGR</td>
</tr>
<tr>
<td>Electricity consumption (EC)</td>
<td>1M81-5M14</td>
<td>MEC</td>
<td>0 months</td>
<td>SA, TA, AGR</td>
</tr>
<tr>
<td>Industry Confidence (IC)</td>
<td>1M87-5M14</td>
<td>European Commission</td>
<td>0 months</td>
<td>SA, L</td>
</tr>
<tr>
<td>Registered Unemployment (U)</td>
<td>1M81-5M14</td>
<td>SEPE</td>
<td>1 month</td>
<td>SA, AGR</td>
</tr>
<tr>
<td>Social security affiliation (SSA)</td>
<td>1M83-5M14</td>
<td>MEYSS</td>
<td>1 month</td>
<td>SA, AGR</td>
</tr>
<tr>
<td>Real credit to the private sector (RCPS)</td>
<td>1M81-4M14</td>
<td>BBVA based on BdE &amp; INE</td>
<td>2 month</td>
<td>SA, AGR</td>
</tr>
<tr>
<td>Mortgage rate minus 12m Euribor (MR12E)</td>
<td>1M89-3M14</td>
<td>BBVA based on BdE &amp; Thompson Reuters</td>
<td>2 month</td>
<td>L</td>
</tr>
<tr>
<td>Financial tensions in Europe (FTE)</td>
<td>10M05-5M14</td>
<td>BBVA</td>
<td>0 months</td>
<td>L</td>
</tr>
<tr>
<td>Mortgage rate minus 12m Treasury bill rate (MR12TBR)</td>
<td>1M89-3M14</td>
<td>BBVA based on BdE &amp; Thompson Reuters</td>
<td>2 month</td>
<td>L</td>
</tr>
</tbody>
</table>
## 1. MICA BBVA

### Variables in the model for EMU

<table>
<thead>
<tr>
<th>Series</th>
<th>Effective Sample</th>
<th>Source</th>
<th>Publication delay</th>
<th>Data transformation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Real GDP (GDP)</td>
<td>80.1-10.2</td>
<td>Eurostat</td>
<td>1.5 months</td>
<td>SA, QGR</td>
</tr>
<tr>
<td>Unemployment rate (UR)</td>
<td>04.01-10.06</td>
<td>Eurostat</td>
<td>2 months</td>
<td>SA, L</td>
</tr>
<tr>
<td>Industrial production (IP)</td>
<td>91.01-10.06</td>
<td>Eurostat</td>
<td>1.5 months</td>
<td>SA, AGR</td>
</tr>
<tr>
<td>Exports (Exp)</td>
<td>90.01-10.06</td>
<td>European Commission</td>
<td>1.5 months</td>
<td>SA, AGR</td>
</tr>
<tr>
<td>ESI Industry (ESII)</td>
<td>85.01-10.08</td>
<td>European Commission</td>
<td>0 months</td>
<td>SA, L</td>
</tr>
<tr>
<td>ESI Consumption (ESIC)</td>
<td>85.01-10.08</td>
<td>European Commission</td>
<td>0 months</td>
<td>SA, L</td>
</tr>
<tr>
<td>ESI Services (ESIS)</td>
<td>95.04-10.08</td>
<td>European Commission</td>
<td>0 months</td>
<td>SA, L</td>
</tr>
<tr>
<td>LHH</td>
<td>04.01-10.07</td>
<td>European Central Bank</td>
<td>2 months</td>
<td>SA, AGR</td>
</tr>
<tr>
<td>Beta</td>
<td>94.01-10.08</td>
<td>BBVA Research</td>
<td>0 months</td>
<td>SA, L</td>
</tr>
</tbody>
</table>
1. MICA-BBVA

The model: mixing frequencies

- How to deal with mixing frequencies in Kalman filter?
  - Series are reduced to **monthly indicators**
  - **Quarterly flow** variable which are $I(1)$
    - Proietti and Moauro (2006): exact filter but nonlinear (implies approximations)
    - Auroba, Diebold and Scotti (2007): exact filter but at the cost of assuming all the indicators to have a linear trend
  - Mariano and Murasawa (2003): approximate filter
    - Simple mean approximated by geometric mean
    - Good approximation of quarterly GDP ($Y_t^*$) if changes in the unobservable monthly GDP ($Y_t$) are small

\[ Y_t^* = 3 \left( \frac{Y_t + Y_{t-1} + Y_{t-2}}{3} \right) \approx 3 \left( Y_t Y_{t-1} Y_{t-2} \right)^{1/3} \]
1. MICA-BBVA

The model: mixing frequencies

- Accordingly

\[ \ln Y_t^* = \frac{1}{3} \left( \ln Y_t + \ln Y_{t-1} + \ln Y_{t-2} \right) + \ln 3 \]

- Quarterly growth rate

\[ \ln Y_t^* - \ln Y_{t-3}^* = \frac{1}{3} \ln \frac{Y_t}{Y_{t-3}} + \frac{1}{3} \ln \frac{Y_{t-1}}{Y_{t-4}} + \frac{1}{3} \ln \frac{Y_{t-2}}{Y_{t-5}} \]

- Defining

\[ y_t^* \equiv \ln Y_t^* - \ln Y_{t-3}^* \quad \quad \quad y_t \equiv \Delta \ln Y_t \]

- Hence

\[ y_t^* = \frac{1}{3} y_t + \frac{2}{3} y_{t-1} + y_{t-2} + \frac{2}{3} y_{t-3} + \frac{1}{3} y_{t-4} \]
1. MICA-BBVA

The model: state-space representation

- There is an unobservable common factor that follows an AR(p1) process:
  \[ x_t = \rho_1 x_{t-1} + \ldots + \rho_p x_{t-p} + e_t \]

- Monthly GDP growth
  \[ y_t = \beta_y x_t + u^y_t \quad u^y_t = d_{1y} u^y_{t-1} + \ldots + d_{py} u^y_{t-p} + \varepsilon^y_t \]

- Annual growth rates of hard and levels of soft indicators
  \[ z^h_t = \beta_i \sum_{j=0}^{11} x_{t-j} + u^h_t \quad u^h_t = d_{1h} u^h_{t-q} + \ldots + d_{ph} u^h_{t-p} + \varepsilon^h_t \]

- Financial indicators (in annual growth rates or in levels) may lead the cycle
  \[ z^f_t = \beta_i \sum_{j=0}^{11} x_{t+h-j} + u^f_t \quad u^f_t = d_{1f} u^f_{t-q} + \ldots + d_{pf} u^f_{t-p} + \varepsilon^f_t \]
1. MICA-BBVA

The model: state-space representation

- Observation equation (e.g., when p1=p2=p3=1 and h=1):

\[
\begin{pmatrix}
    y_t^* \\
    Z_t^* \\
    Z_n^*
\end{pmatrix} =
\begin{pmatrix}
    0 & \frac{\beta_y}{3} & \frac{2\beta_y}{3} & \frac{2\beta_y}{3} & \frac{1\beta_y}{3} & 0 & \ldots & 0 & \frac{1}{3} & \frac{2}{3} & \frac{2}{3} & \frac{1}{3} & 0 & 0 \\
    0 & \beta_i & \beta_i & \ldots & \ldots & \beta_i & 0 & \ldots & \ldots & 0 & 1 & 0 \\
    \beta_f & \beta_f & \ldots & \beta_f & 0 & 0 & \ldots & 0 & 0 & 1
\end{pmatrix}
\begin{pmatrix}
    x_{t+1} \\
    x_t \\
    \vdots \\
    x_{t-11} \\
    u_t^y \\
    \vdots \\
    u_{t-4}^y \\
    u_t^i \\
    u_t^f \\
    u_t^i
\end{pmatrix}
\]
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The model: dealing with missing observations

- Quarterly series are observed once each quarter, but for some soft and have indicators we have missing observations.
- We follow Mariano and Murasawa (2003).
- **Substitute missing values by random draws** $N(0,1)$

\[ Y_{it}^* = \begin{cases} 
Y_{it} & \text{if observable} \\
\theta_t & \text{otherwise} 
\end{cases} \]

- While keeping all the matrices conformable, it has no impact on MLE.
- At each time $t$,
  - Observed data are used to estimate the state vector.
  - State vector and the idiosyncratic component are used to estimate missing values.
  - Forecasting can be done by adding missing values at the end.
1. MICA-BBVA
Results: common factors

**Spain: GDP growth (q/q) and common factor**
Source: BBVA

**EMU: GDP growth (q/q) and common factor**
Source: BBVA
1. MICA-BBVA

Results: loading factors

### Spain: loading factors

Source: Camacho and Doménech (2012); t-ratios in parentheses

<table>
<thead>
<tr>
<th></th>
<th>GDP</th>
<th>CCS</th>
<th>CC</th>
<th>EC</th>
<th>RWI</th>
<th>IC</th>
<th>U</th>
<th>SSA</th>
<th>RCPS</th>
<th>MR12E</th>
<th>FTE</th>
<th>MR12TBR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Loading factor</td>
<td>0.200</td>
<td>0.024</td>
<td>0.039</td>
<td>0.045</td>
<td>0.045</td>
<td>0.045</td>
<td>-0.011</td>
<td>0.064</td>
<td>0.014</td>
<td>-0.013</td>
<td>-0.033</td>
<td>-0.19</td>
</tr>
<tr>
<td>t-ratio</td>
<td>(12.3)</td>
<td>(1.7 )</td>
<td>(4.1  )</td>
<td>(5.5  )</td>
<td>(15.3)</td>
<td>(5.5  )</td>
<td>(3.5  )</td>
<td>(32.4)</td>
<td>(3.5  )</td>
<td>(2.0  )</td>
<td>(2.2  )</td>
<td>(1.4)</td>
</tr>
</tbody>
</table>

### EMU: loading factors

Source: Camacho and García-Serrador (2014); standard errors in parentheses

<table>
<thead>
<tr>
<th></th>
<th>GDP</th>
<th>UR</th>
<th>IPI</th>
<th>EXP</th>
<th>ESII</th>
<th>ESIC</th>
<th>ESIS</th>
<th>LHH</th>
<th>BETA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Loading factor</td>
<td>0.10</td>
<td>-0.005</td>
<td>0.04</td>
<td>0.03</td>
<td>0.03</td>
<td>0.02</td>
<td>0.02</td>
<td>0.011</td>
<td>0.02</td>
</tr>
<tr>
<td>std. errors</td>
<td>(0.04)</td>
<td>(0.03)</td>
<td>(0.01)</td>
<td>(0.01)</td>
<td>(0.01)</td>
<td>(0.01)</td>
<td>(0.01)</td>
<td>(0.005)</td>
<td>(0.01)</td>
</tr>
</tbody>
</table>
1. MICA-BBVA

Results: recession probabilities

Spain: Recession probability (%)
Source: BBVA Research

EMU: Recession probability (%)
Source: BBVA Research

EMU: Markov-switching estimates
Source: Camacho and García-Serrador (2014)

\[

c_0 \\ c_1 \\ \alpha_1 \\ \sigma^2 \\ p_{00} \\ p_{11}
\]

<p>| | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>0.34</td>
<td>-5.30</td>
<td>0.88</td>
<td>3.51</td>
<td>0.98</td>
<td>0.76</td>
</tr>
<tr>
<td>(0.11)</td>
<td>(0.61)</td>
<td>(0.02)</td>
<td>(0.28)</td>
<td>(0.01)</td>
<td>(0.10)</td>
</tr>
</tbody>
</table>

Note: The estimated model is \( x_t = c_{x_t} + \alpha_1 x_{t-1} + \epsilon_t \), where \( x_t \) is the common factor and \( \epsilon_t \) i.i.d. \( N(0, \sigma^2) \), and \( p(\epsilon_t = 0 \mid x_{t-1} = \epsilon_t) = p_{01} \).
1. MICA-BBVA

Results: nowcasting

Spain: MICA-BBVA and GDP growth (% QoQ)
Source: BBVA Research based on INE

Eurozone: MICA-BBVA and GDP growth (% QoQ)
Source: Eurostat and BBVA Research
1. MICA-BBVA

Results: predictive accuracy for Spain

<table>
<thead>
<tr>
<th></th>
<th>Back</th>
<th>Now</th>
<th>Fore</th>
</tr>
</thead>
<tbody>
<tr>
<td>MSE-MICA</td>
<td>0.1377</td>
<td>0.1938</td>
<td>0.2596</td>
</tr>
<tr>
<td>MSE-RW</td>
<td>0.3513</td>
<td>0.3567</td>
<td>0.3605</td>
</tr>
<tr>
<td>MSE-MICA/MSE-RW</td>
<td>0.3919</td>
<td>0.5432</td>
<td>0.7201</td>
</tr>
<tr>
<td>MSE-AR</td>
<td>0.2069</td>
<td>0.2802</td>
<td>0.3089</td>
</tr>
<tr>
<td>MSE-MICA/MSE-AR</td>
<td>0.6652</td>
<td>0.6916</td>
<td>0.8404</td>
</tr>
</tbody>
</table>

Equal predictive accuracy tests

<table>
<thead>
<tr>
<th></th>
<th>Back</th>
<th>Now</th>
<th>Fore</th>
</tr>
</thead>
<tbody>
<tr>
<td>DM-RW</td>
<td>0.0001</td>
<td>0.0004</td>
<td>0.0046</td>
</tr>
<tr>
<td>DM-AR</td>
<td>0.0002</td>
<td>0.0008</td>
<td>0.0581</td>
</tr>
<tr>
<td>MDM-RW</td>
<td>0.0001</td>
<td>0.0004</td>
<td>0.0049</td>
</tr>
<tr>
<td>MDM-AR</td>
<td>0.0002</td>
<td>0.0009</td>
<td>0.0590</td>
</tr>
<tr>
<td>WSR-RW</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
</tr>
<tr>
<td>WSR-AR</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
</tr>
<tr>
<td>MGN-RW</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
</tr>
<tr>
<td>MGN-AR</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
</tr>
<tr>
<td>MR-RW</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
</tr>
<tr>
<td>MR-AR</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
</tr>
</tbody>
</table>

Encompassing tests

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>RW/MICA</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
</tr>
<tr>
<td>AR/MICA</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
</tr>
</tbody>
</table>

\[ y_t - \hat{y}_{t,i} = a_0 + a_1 \hat{y}_{t,MICA} + e_t \]
## 1. MICA-BBVA

Results: predictive accuracy for EMU

### Table IV. Predictive accuracy

<table>
<thead>
<tr>
<th></th>
<th>Backcasts</th>
<th>Nowcasts</th>
<th>Forecasts</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mean squared errors</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MICA</td>
<td>0.138</td>
<td>0.298</td>
<td>0.403</td>
</tr>
<tr>
<td>RW</td>
<td>0.370</td>
<td>0.361</td>
<td>0.377</td>
</tr>
<tr>
<td>MICA/RW</td>
<td>0.111</td>
<td>0.107</td>
<td>0.113</td>
</tr>
<tr>
<td>AR</td>
<td>0.297</td>
<td>0.369</td>
<td>1.070</td>
</tr>
<tr>
<td>MICA/AR</td>
<td>0.098</td>
<td>0.127</td>
<td>0.114</td>
</tr>
<tr>
<td>MICA2</td>
<td>0.466</td>
<td>0.824</td>
<td>1.071</td>
</tr>
<tr>
<td>MICA/MICA2</td>
<td>0.151</td>
<td>0.348</td>
<td>1.071</td>
</tr>
<tr>
<td>MS</td>
<td>0.012</td>
<td>0.321</td>
<td>0.4647</td>
</tr>
<tr>
<td>MICA/MS</td>
<td>0.019</td>
<td>0.856</td>
<td>0.867</td>
</tr>
<tr>
<td>TAR</td>
<td>0.212</td>
<td>0.321</td>
<td>0.403</td>
</tr>
<tr>
<td>MICA/TAR</td>
<td>0.128</td>
<td>0.178</td>
<td>0.177</td>
</tr>
<tr>
<td>STING</td>
<td>0.544</td>
<td>0.898</td>
<td>1.047</td>
</tr>
<tr>
<td>MICA/STING</td>
<td>0.176</td>
<td>0.667</td>
<td>0.750</td>
</tr>
</tbody>
</table>

### Equal predictive accuracy tests

<table>
<thead>
<tr>
<th>Test</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>MICA vs RW</td>
<td>0.004</td>
</tr>
<tr>
<td>MICA vs AR</td>
<td>0.001</td>
</tr>
<tr>
<td>MICA vs MICA2</td>
<td>0.002</td>
</tr>
<tr>
<td>MICA vs MS</td>
<td>0.005</td>
</tr>
<tr>
<td>MICA vs TAR</td>
<td>0.022</td>
</tr>
</tbody>
</table>

Note: The forecasting sample is 1990:Q1–2010:Q1, which implies comparisons over 492 forecasts. Entries in rows 1–12 are mean squared errors (MSE) of dynamic factor model with ESI indicators (MICA), random walk (RW), autoregressive of order two (AR), dynamic factor model with PMI indicators (MICA2), Markov switching of order two (MS), TAR of order two (TAR), and the Euro-STING model (STING), along with the relative MSEs over that of ESI. R and E refer to recessions and expansions periods according to CEPR. The last six rows show the p-values of the Diebold–Mariano (DM) test of equal forecast accuracy.
1. MICA-BBVA

Conclusions

• We have proposed an extension of the Stock and Watson (1991) single-index dynamic factor model for the Spanish and EMU quarterly GDP growth.

• The model combines information from real and financial indicators with different frequencies, short samples and publication lags.

• The common factor reflects the behavior of the Spanish and EMU GDP growth during expansions and contractions very well.

• Financial indicators are useful for forecasting output growth especially when assuming that some financial variables lead the common factor.

• We provide a simulated pseudo-real-time exercise, showing that the model is a valid tool to be used for short-term analysis and better than other alternative models.

• Extensions:
  • Models for aggregate demand components
  • Stock vs gross flow of credit
Both real activity variables (consumption, investment) and new credit operations are flows. New loans provide a better match of activity than the stock of credit.

The process of deleveraging (reduction of the stock of credit) is compatible with new credit provision (increase in the flow of credit) for solvent projects.

A turning point is already visible in EMU: an improvement in credit flows to household and SMEs, which will be strengthened over second half of 2013 and 2014.

At the EMU level, there is a stronger correlation of GDP growth with new loans growth (0.9) than with credit stock growth (0.6).

The growth of new loans leads GDP growth in two quarters. Loans to households lead consumption, whereas loans to SME are contemporaneous to investment. On the contrary, GDP growth leads credit stock growth.
1. MICA-BBVA

Extension: gross flows of credit and economic activity

**Eurozone: GDP and credit growth (% YoY)**

- **Note:** Retail loans is the sum of loans to households and to firms up to €1M
- **Source:** ECB, Eurostat and BBVA Research

New retail loans (for household consumption and SME’s investment) are growing, despite the fall of their stock

Stronger correlation of GDP growth with new loans growth (0.9) than with credit stock growth (0.6)

The growth of new loans leads GDP by two quarters, mostly because credit to households leads consumption
1. MICA-BBVA

Extension: gross flows of credit and economic activity

**Spain: investment and credit growth (% YoY)**

Source: ECB, Eurostat and BBVA Research

- **Investment**
- **New loans to firms up to €1M (RHS)**
- **Stock loans to firms (RHS)**

The process of debt reduction is compatible with credit provision for solvent projects.

Turning point: Investment is already recovering (machinery and equipment), with new loans to SME’s accelerating ...

... despite the fact that the credit stock is still falling, due to the high repayments that accompany the deleveraging process.
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1. MICA-BBVA for short-term forecasting of GDP, with results for Spain and EMU

2. Trimmed mean inflation for Japan, EMU and Spain
2. Trimmed mean inflation for Japan, EMU and Spain

Motivation: inflation expectations below the ECB target

**Eurozone: unemployment rate and inflation**
Source: Eurostat and BBVA Research

The double-dip recession (unemployment) and M3 growth partially explain the low rate of inflation in EMU.

If 3 pp of higher unemployment explain 0.4 pp lower inflation, inflation expectations are currently less than 1% -> drag for the economic recovery.

Inflation expectations in swaps and trimmed mean inflation (optimal selection in terms of inflation prediction for next 2/3 years) are slightly below 1%.

Although inflation will be above 1% in 2015 in our base scenario and the probability of deflation is low (<10%), adverse shocks could increase this probability.

The regression coefficient of the inflation rate on the unemployment rate is equal to 0.125, statistically significant and robust to the exclusion of Cyprus, Greece and Spain.
2. Trimmed mean inflation for Japan, EMU and Spain

Motivation: inflation expectations below the ECB target

The double-dip recession (unemployment) and M3 growth partially explain the low rate of inflation in EMU

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EMU Inflation expectations in swaps are slightly below 1%

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Methodology

- Following Bryan, Cecchetti and Wiggins (1997) and Dolmas (2005), the trimmed mean is given by

\[ \bar{\pi}_{\alpha,\beta} = \frac{1}{n-j-k} \sum_{i=j+1}^{n-k} w_i \pi_i, \quad \alpha, \beta = (1,2,\ldots,50) \]

where \( \pi \) is the monthly price growth rate and \( w \) its weight

- We compute 2,601 symmetric and asymmetric trimmed means using the weighted distribution of the CPI subclasses (95 for EMU, 126 for Spain and 589 for Japan)

- As Meyer and Venkatu (2014), we then selected the optimal trimmed mean based on its predictive capacity with respect to annualized mean inflation over a forecast horizon of 30 months

- Finally, we compute confidence intervals around the optimum trimmed-mean selected using the predictive capacity test proposed by Diebold and Mariano (1995)

- See also BBVA Research (2014)
2. Trimmed mean inflation for Japan, EMU and Spain

Results for Japan

Japan: optimal trimmed mean for inflation and confidence intervals (forecast horizon: 30 months, 1980-2013)

Source: BBVA Research

\[ \alpha = 21 \]

\[ \beta = 38 \]
2. Trimmed mean inflation for Japan, EMU and Spain

Results for Japan

Japan: inflation, core and trimmed mean inflation (% YoY)
Source: BBVA Research

The trimmed mean confidence intervals started pointing non-negligible deflation probabilities before it already happened.

The optimal trimmed mean inflation dropped below zero about a quarter before the headline inflation started to fall.

Between two to three quarters before the core inflation started to fall.

- CI 95
- CI 60
- CI 20
- Optimal Trim
- Series14
- Core (official)
- CI 80
- CI 40
- Headline (official)
2. Trimmed mean inflation for Japan, EMU and Spain

Results for Japan

**Japan: inflation, core and trimmed mean inflation (% YoY)**

- A deflationary scenario still cannot be ruled out in Japan
- Recently headline and core inflation returned to positive ...
- ... but the optimal trimmed mean inflation still remains below zero
2. Trimmed mean inflation for Japan, EMU and Spain

Results for EMU

**EMU: optimal trimmed mean for inflation and confidence intervals**
*(forecast horizon: 30 months, 1996-2013)*

Source: BBVA Research

\[ \alpha = 43 \]

\[ \beta = 38 \]
2. Trimmed mean inflation for Japan, EMU and Spain

Results for EMU

EMU: inflation, core and trimmed mean inflation (% YoY)
Source: BBVA Research

The optimal trimmed mean inflation signals future inflation at around 1.0%

Uncertainty has increased...

... but probability of deflations seems to be well quite low (between 2.5% and 10%)
2. Trimmed mean inflation for Japan, EMU and Spain

Results for EMU

EMU: CPI items with persistent negative growth rates

Deflation probability in EMU is quite low

Less than 3% of the CPI components show negative inflation, with a persistence between 9 and 12 months

less than 10% of the CPI components show negative inflation, with a persistence between 3 and 6 months

Source: BBVA Research
2. Trimmed mean inflation for Japan, EMU and Spain

Results for Spain: trimmed mean close to the median

\[ \alpha = 43 \]

\[ \beta = 50 \]
2. Trimmed mean inflation for Japan, EMU and Spain

Results for Spain: trimmed mean close to the median

Spain: inflation, core and trimmed mean inflation (% YoY)
Source: BBVA Research

The optimal trimmed mean inflation shows a negative trend that is more stable than in the case of core inflation.

Core inflation is more volatile due to changes in indirect taxes and the volatility of commodities.

20% of probability of having negative inflation rates in the next 30 months.
2. Trimmed mean inflation for Japan, EMU and Spain

Results for Spain

Spain: CPI items with persistent negative growth rates

Deflation probability in Spain is higher than in EMU

- 10% of the CPI components show negative inflation, with a persistence between 9 and 12 months
- 20% of the CPI components show negative inflation, with a persistence between 3 and 6 months
2. Trimmed mean inflation for Japan, EMU and Spain

Conclusions

- Current inflation levels and expectation for the next 2 years point to a scenario of “too low inflation for too long”, both in Spain and in EMU
- Given the risks of a deflationary scenario, it is necessary to have good forecasting models over horizons of 2 to 3 years and trimmed mean measures are complementary to other alternative approaches
- Trimmed mean inflation rates have better predictive properties than core inflation
- Medium-term expectations: the most likely scenario is that trending inflation remains low but positive in EMU, close to zero in Spain and still negative in Japan
- Policy implications:
  - **Japan**: the BoJ should continue quantitative easing until trimmed mean inflation rate is positive
  - **EMU**: the ECB should anchor 2y inflation expectations close to 2%
  - **Spain** must continue to improve competitiveness, with a negative inflation differential
References


Forecasting GDP and inflation in EMU and Spain

Rafael Doménech
Federal Reserve Bank of Dallas, June 17, 2014