Turning points of the Financial and the Real Estate Market

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Agenda

- Introduction
- Motivation
- Data
- Methodology
- Results
- Conclusion
Introduction

• Importance of determining Business cycles

• Turning Points: peak and trough

• Non parametric approach: Bry-Boschan algorithm (1971)
  • Parametric approach: Markov Switching Model (Hamilton, 1989)

• Housing as Business cycle (Leamer, 2007)
  • Housing as an important indicator to measure economic expansions (Angello and Schuknecht, 2009, Detken and Alessi, 2009).

• Analysis of the Housing market and the financial market by applying the BB algorithm (Bunda and Ca'Zorzi, 2009)
Motivation

- Applying the parametric and the non-parametric approaches to analyse the starting dates of the recessions

- Which method identify better the turning points in the Financial Market and the Real Estate Market

- Analysing the difference between the turning points in the commercial, residential, Real Estate Investment Trust and Stock markets
Data

- Sample length: from 01/1987 to 01/2010

- **UK**
  Residential: Halifax Price index  
  Commercial: Investment Property Databank index (IPD)  
  REIT index: Real Estate Investment Trust  
  Stock market: FTSE 500

- **USA**
  Commercial: SP/Case Shiller 10 composite index  
  REIT index  
  Stock market: S&P500
Methodology


\[
\begin{align*}
    s_t &= 1 \text{ regime in expansion} \\
    s_t &= 2 \text{ regime in recession}
\end{align*}
\]  

(1)

The transition probabilities are:

\[
\begin{align*}
    p(s_t = 1|s_{t-1} = 1) &= p_{11} \\
    p(s_t = 2|s_{t-1} = 1) &= 1 - p_{11} = p_{21} \\
    p(s_t = 2|s_{t-1} = 2) &= p_{22}
\end{align*}
\]  

(2)

\[
\begin{align*}
    \Delta y_t &= \mu_{s_t} + \varepsilon_t \\
    \mu_{s_t} &= \mu_0 (1 - S_t) + \mu_1 S_t \\
    \varepsilon_t &\sim iid \mathcal{N}(0, \sigma^2)
\end{align*}
\]  

(3)
• Non parametric approach Bry-Boschan (1971)

• Step 1: Determination of extreme values.

• Step 2: Determination of cycles in 12-month moving average. For this step and the subsequent steps, consider the alternation of turns by selecting highest of multiple peaks and lowest of multiple troughs.

• Step 3: Application of Spencer curve on the series resulting from the step 2, “update” the turning points and elimination of the too short cycles.

• Step 4: Detection of turning points on the resulted series of step 3 with a new moving average filter and elimination of short cycles.

• Step 5: Determination of turning points in the original series taking into account information obtained through the step 4 and elimination of the too short cycles.

• Step 6: Statement of final turning points.
Table 1. Estimates of the Markov Switching Model for returns

<table>
<thead>
<tr>
<th></th>
<th>Halifax</th>
<th>REIT</th>
<th>IPD</th>
<th>FTSE 500</th>
<th>REIT</th>
<th>USA</th>
<th>SP/CS 10</th>
<th>S&amp;P500</th>
</tr>
</thead>
<tbody>
<tr>
<td>$p_{12}$</td>
<td>0.0458</td>
<td>0.0128</td>
<td>0.0253</td>
<td>0.0464</td>
<td>0.0302</td>
<td>0.0228</td>
<td>0.0369</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.0432)</td>
<td>(0.0095)</td>
<td>(0.0177)</td>
<td>(0.0317)</td>
<td>(0.0361)</td>
<td>(0.0080)</td>
<td>(0.0162)</td>
<td></td>
</tr>
<tr>
<td>$p_{21}$</td>
<td>0.0558</td>
<td>0.0531</td>
<td>0.0430</td>
<td>0.0240</td>
<td>0.1015</td>
<td>0.0176</td>
<td>0.1023</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.0708)</td>
<td>(0.0325)</td>
<td>(0.0161)</td>
<td>(0.0219)</td>
<td>(0.0547)</td>
<td>(0.0123)</td>
<td>(0.0512)</td>
<td></td>
</tr>
<tr>
<td>$\mu_1$</td>
<td>1.1243</td>
<td>0.7120</td>
<td>0.9757</td>
<td>1.1168</td>
<td>1.0515</td>
<td>0.9509</td>
<td>1.2287</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.0680)</td>
<td>(0.4243)</td>
<td>(0.0759)</td>
<td>(0.1969)</td>
<td>(0.5822)</td>
<td>(0.0524)</td>
<td>(0.1925)</td>
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<tr>
<td>$\mu_2$</td>
<td>-0.2711</td>
<td>-1.4333</td>
<td>0.1002</td>
<td>-0.0001</td>
<td>-1.8654</td>
<td>-0.3415</td>
<td>-1.4158</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.1212)</td>
<td>(2.0668)</td>
<td>(0.3850)</td>
<td>(0.4203)</td>
<td>(1.3938)</td>
<td>(0.0682)</td>
<td>(1.2053)</td>
<td></td>
</tr>
<tr>
<td>$\sigma_1$</td>
<td>0.2340</td>
<td>0.6717</td>
<td>0.4505</td>
<td>0.0766</td>
<td>0.9514</td>
<td>0.4808</td>
<td>0.3301</td>
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</tr>
<tr>
<td></td>
<td>(1.6046)</td>
<td>(0.2252)</td>
<td>(0.0667)</td>
<td>(0.2169)</td>
<td>(0.8428)</td>
<td>(0.0271)</td>
<td>(0.1685)</td>
<td></td>
</tr>
<tr>
<td>$\sigma_2$</td>
<td>1.0261</td>
<td>1.3977</td>
<td>1.8343</td>
<td>1.5997</td>
<td>1.6582</td>
<td>1.7540</td>
<td>1.8968</td>
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<tr>
<td></td>
<td>(3.4432)</td>
<td>(0.2848)</td>
<td>(0.1595)</td>
<td>(0.5404)</td>
<td>(3.0275)</td>
<td>(0.0639)</td>
<td>(0.7478)</td>
<td></td>
</tr>
</tbody>
</table>
Results on UK Markets

Halifax return and probability of being in expansion

BB algorithm on the Halifax price index
REIT return and probability of being in expansion

BB algorithm on the REIT UK price index
IPD return and probability of being in expansion

BB algorithm on the IPD
FTSE 500 return and probability of being in expansion

BB algorithm on FTSE 500 price index
Results on US Markets

REIT return and probability of being in expansion

BB algorithm on the REIT US price index
SP/CS 10 composite return and probability of being in expansion

BB algorithm on the SP/CS 10 composite price index
S&P 500 return and probability of being in expansion

BB algorithm on the S&P 500 price index
Table 2. Dating recessions using the BB algorithm (UK data)

<table>
<thead>
<tr>
<th>Halifax Start**</th>
<th>End***</th>
<th>REIT Start**</th>
<th>End***</th>
<th>IPD Start**</th>
<th>End***</th>
<th>FTSE 500 Start**</th>
<th>End***</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>05/2002</td>
<td>04/2003</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

** Identify a peak in the graphs of the BB algorithm
*** Identify a trough in the graphs of the BB algorithm

Table 3. Dating recessions using the MSM (UK data)

<table>
<thead>
<tr>
<th>Halifax Start</th>
<th>End</th>
<th>REIT Start</th>
<th>End</th>
<th>IPD Start</th>
<th>End</th>
<th>FTSE 500 Start</th>
<th>End</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>09/1997</td>
<td>05/2003</td>
</tr>
</tbody>
</table>
• Start dates for UK recessions

Halifax
IPD
REIT
FTSE500

Table 3. Dating recessions using the BB algorithm (US data)

<table>
<thead>
<tr>
<th>REIT</th>
<th></th>
<th>SP/CS10</th>
<th></th>
<th>S&amp;P 500</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Start**</td>
<td>End***</td>
<td>Start**</td>
<td>End***</td>
</tr>
<tr>
<td>XXXX</td>
<td>12/1987</td>
<td></td>
<td>XXXX</td>
<td>12/1987</td>
</tr>
<tr>
<td>08/1991</td>
<td>02/1994</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10/1997</td>
<td></td>
<td>08/2000</td>
<td>02/2003</td>
<td></td>
</tr>
<tr>
<td>04/2002</td>
<td>10/2002</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 4. Dating recessions using the MSM (US data)

<table>
<thead>
<tr>
<th>REIT</th>
<th></th>
<th>SP/CS10</th>
<th></th>
<th>S&amp;P 500</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Start</td>
<td>End</td>
<td>Start</td>
<td>End</td>
</tr>
<tr>
<td>02/1987</td>
<td>01/1988</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
• Start dates for US recessions

SP/CS 10
REIT
S&P 500


Conclusion

• Since the BB algorithm detects local minima and maxima, this is the main reason behind the many turning points resulting from this approach

• The Markov switching model gives better results than the Bry-Boschan model. For the latter, assuming that the expansions and contractions of minimum duration can conduct to misleading interpretations

• REIT detects better the turning points of the Real Estate market.
• Detect linear and non linear causality between the two markets.
Thank you!