A new global database of *de facto* exchange rate regimes

Ila Patnaik    Ajay Shah    Anmol Sethy    Achim Zeileis

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2 Methodology

3 Applications
- Exchange rate flexibility
- Role of major currencies
Motivation

- *De jure* exchange rate regime different from *de facto* regime.

- *De facto* regime classifications:
  - Calvo and Reinhart (2002)
  - Reinhart and Rogoff (2004)
  - Frankel and Xie (2010)

- *De facto* exchange rate regime databases
  - IMF classification
  - Reinhart and Rogoff
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IMF de facto classification

**Frequency** Monthly

**Span** 1998-2009

**Method** Change in 2009; Qualitative classification

**Update** Quarterly

**Classification** Based on algorithms, on *de jure* regime and on judgement.

**Categories** Nine descriptive categories.
IMF de facto classification

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Reinhart and Rogoff (2004)

**Frequency**  Monthly

- **Span**: January 1946 - December 2007
- **Method**: No change, but greater detail.

**Classification**  Based on algorithms, on black market rates, and on judgement.

**Categories**  Seven (now fourteen) descriptive categories.
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Classification should be

1. Based an algorithm
2. Eliminate human judgement
3. Publicly available
4. Replicable
5. Possible to update when required
6. Anyone can analyse and improve methodology
7. Outlive the authors’ involvement.
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The new *de facto* exchange rate regime classification

METHODOLOGY
The methodology adopts the linear regression model used in Haldane and Hall (1991) and Frankel and Wei (1994).

A tool for understanding the de facto exchange rate regime in operation is a linear regression model based on cross-currency exchange rates (with respect to a suitable numeraire, e.g., CHF).

If estimation involving the Indian Rupee (INR) is desired, the model estimated is:

\[
d \log \left( \frac{\text{INR}}{\text{CHF}} \right) = \beta_1 + \beta_2 d \log \left( \frac{\text{USD}}{\text{CHF}} \right) + \beta_3 d \log \left( \frac{\text{JPY}}{\text{CHF}} \right) + \beta_4 d \log \left( \frac{\text{DEM}}{\text{CHF}} \right) + \beta_5 d \log \left( \frac{\text{GBP}}{\text{CHF}} \right) + \epsilon
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Perron and Bai (2003) provides a methodology for identification of structural change in an OLS regression. This has been used in Frankel and Xie (2010) to identify structural change in exchange rate regimes. Zeileis Shah and Patnaik (2010 (forthcoming)) extend the Perron and Bai (2003) methodology for identification of structural change in an OLS regression to a general MLE setting, to identify the parameter vector that incorporates the error term as a full parameter, thus identifying $\theta = (\beta, \sigma_\epsilon)$. 
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Our database
Database span: 1991-02-01 to 2009-11-24

Total number of currencies: 143
## Currencies in the database

<table>
<thead>
<tr>
<th>Regions</th>
<th>1991-02-01</th>
<th>1996-02-01</th>
<th>2002-02-01</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asia</td>
<td>19</td>
<td>41</td>
<td>44</td>
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<tr>
<td>Africa</td>
<td>8</td>
<td>33</td>
<td>38</td>
</tr>
<tr>
<td>N.America</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>S.America</td>
<td>8</td>
<td>25</td>
<td>26</td>
</tr>
<tr>
<td>Oceania</td>
<td>3</td>
<td>6</td>
<td>8</td>
</tr>
<tr>
<td>E.Europe</td>
<td>1</td>
<td>9</td>
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</tr>
<tr>
<td>ROW</td>
<td>6</td>
<td>12</td>
<td>15</td>
</tr>
<tr>
<td>World</td>
<td>48</td>
<td>129</td>
<td>143</td>
</tr>
</tbody>
</table>
Our database

Frequency  Weekly
Span        February 1991 - December 2009
Method      Zeileis, Shah and Patnaik (2010 (forthcoming))
Update      Codes available online; researcher may update as and when necessary.
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Examples
Example: South Korea
Example: South Korea
FW regression for Korea

<table>
<thead>
<tr>
<th>Start</th>
<th>End</th>
<th>$r^2$</th>
<th>USD</th>
<th>DUR</th>
<th>GBP</th>
<th>JPY</th>
<th>$\sigma^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>1991-01-11</td>
<td>2009-12-25</td>
<td>0.56</td>
<td>0.67</td>
<td>0.23</td>
<td>0.13</td>
<td>0.11</td>
<td>1.30</td>
</tr>
</tbody>
</table>
South Korea with structural breaks

<table>
<thead>
<tr>
<th>Start Date</th>
<th>End Date</th>
<th>$R^2$</th>
<th>USD</th>
<th>DUR</th>
<th>GBP</th>
<th>JPY</th>
<th>Variance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1991-01-11</td>
<td>1995-01-20</td>
<td>0.98</td>
<td>1.01</td>
<td>-0.00</td>
<td>-0.01</td>
<td>-0.02</td>
<td>0.07</td>
</tr>
<tr>
<td>1995-01-27</td>
<td>1997-11-14</td>
<td>0.83</td>
<td>0.87</td>
<td>-0.06</td>
<td>0.07</td>
<td>0.16</td>
<td>0.42</td>
</tr>
<tr>
<td>1997-11-21</td>
<td>1998-09-11</td>
<td>0.15</td>
<td>-1.03</td>
<td>1.27</td>
<td>1.17</td>
<td>-0.09</td>
<td>7.58</td>
</tr>
<tr>
<td>1998-09-18</td>
<td>2006-05-19</td>
<td>0.70</td>
<td>0.63</td>
<td>0.18</td>
<td>0.06</td>
<td>0.31</td>
<td>0.81</td>
</tr>
<tr>
<td>2006-05-26</td>
<td>2008-02-22</td>
<td>0.79</td>
<td>0.84</td>
<td>0.33</td>
<td>0.01</td>
<td>-0.15</td>
<td>0.27</td>
</tr>
<tr>
<td>2008-02-29</td>
<td>2009-12-25</td>
<td>0.28</td>
<td>0.44</td>
<td>0.52</td>
<td>0.12</td>
<td>-0.27</td>
<td>3.10</td>
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<th>DUR</th>
<th>GBP</th>
<th>JPY</th>
<th>$\sigma^2$</th>
</tr>
</thead>
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<tr>
<td>1991-01-11</td>
<td>2009-12-25</td>
<td>0.81</td>
<td>0.64</td>
<td>0.22</td>
<td>0.06</td>
<td>0.12</td>
<td>0.32</td>
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Singapore with structural breaks

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<th>End</th>
<th>$R^2$</th>
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<th>DUR</th>
<th>GBP</th>
<th>JPY</th>
<th>Variance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1991-01-11</td>
<td>1997-07-11</td>
<td>0.92</td>
<td>0.78</td>
<td>0.16</td>
<td>0.01</td>
<td>0.10</td>
<td>0.15</td>
</tr>
<tr>
<td>2</td>
<td>1997-07-18</td>
<td>1998-10-16</td>
<td>0.22</td>
<td>-0.02</td>
<td>0.32</td>
<td>0.31</td>
<td>0.24</td>
<td>1.28</td>
</tr>
<tr>
<td>3</td>
<td>1998-10-23</td>
<td>2001-10-12</td>
<td>0.85</td>
<td>0.77</td>
<td>0.12</td>
<td>0.03</td>
<td>0.09</td>
<td>0.32</td>
</tr>
<tr>
<td>4</td>
<td>2001-10-19</td>
<td>2007-08-10</td>
<td>0.89</td>
<td>0.60</td>
<td>0.22</td>
<td>0.04</td>
<td>0.23</td>
<td>0.12</td>
</tr>
<tr>
<td>5</td>
<td>2007-08-17</td>
<td>2009-12-25</td>
<td>0.82</td>
<td>0.59</td>
<td>0.29</td>
<td>0.07</td>
<td>-0.02</td>
<td>0.26</td>
</tr>
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Well known results and our database
How do we fare?

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<thead>
<tr>
<th>Country</th>
<th>Date</th>
<th>Event</th>
<th>Our date</th>
<th>$R^2$; Wt.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brazil</td>
<td>1999-01-16</td>
<td>Break peg</td>
<td>1999-01-15</td>
<td>0.424; USD</td>
</tr>
<tr>
<td>Turkey</td>
<td>2001-02-15</td>
<td>New Turkish lira</td>
<td>2001-02-16</td>
<td>0.241</td>
</tr>
<tr>
<td>Sweden</td>
<td>1992-09-01</td>
<td>Float</td>
<td>1992-07-31</td>
<td>0.330; ECU</td>
</tr>
<tr>
<td>China</td>
<td>2005-05-22</td>
<td>Basket crawl</td>
<td>2005-05-22</td>
<td>0.970; USD</td>
</tr>
<tr>
<td>Malaysia</td>
<td>2005-05-22</td>
<td>Managed Float</td>
<td>2004-05-22</td>
<td>0.744; USD</td>
</tr>
</tbody>
</table>
The global database
Some applications

- Has exchange rate flexibility risen over the years across the world?
- What is the role of major currencies in exchange rate management?
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Exchange rate flexibility
Average global $R^2$
Average $R^2$ across different regions

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<th></th>
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<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Asia</td>
<td>0.8785</td>
<td>0.8309</td>
<td>0.8338</td>
</tr>
<tr>
<td>East Asia</td>
<td>0.9866</td>
<td>0.8262</td>
<td>0.7240</td>
</tr>
<tr>
<td>Latin America</td>
<td>0.7726</td>
<td>0.8038</td>
<td>0.8110</td>
</tr>
<tr>
<td>Africa</td>
<td>0.7100</td>
<td>0.6124</td>
<td>0.6159</td>
</tr>
<tr>
<td>Oceania</td>
<td>0.6005</td>
<td>0.5514</td>
<td>0.4606</td>
</tr>
<tr>
<td>E.Europe</td>
<td>NA</td>
<td>0.4228</td>
<td>0.4758</td>
</tr>
</tbody>
</table>
Summary: Exchange rate flexibility

- There is no clear trend in the mean flexibility across the globe.
- East Asia is the most inflexible.
- Africa is more flexible.
- Latin America remains inflexible.
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Role of major currencies
Secular decline in the Dollar across the world
The secular rise of the Euro across the world
British Pound as an international currency
Yen no longer an international currency
### Average coefficients across different regions

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<tr>
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<tbody>
<tr>
<td></td>
<td>USD</td>
<td>DEM</td>
<td>USD</td>
</tr>
<tr>
<td>Asia</td>
<td>0.91</td>
<td>0.06</td>
<td>0.95</td>
</tr>
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<td>East Asia</td>
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<td>0.91</td>
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<td>0.94</td>
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<td>0.40</td>
<td>0.81</td>
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<td>0.64</td>
</tr>
<tr>
<td>E.Europe</td>
<td>NA</td>
<td>NA</td>
<td>0.53</td>
</tr>
</tbody>
</table>
Summary: Role of major currencies

- There is a rise in Euro as an international currency.
- The decline of the dollar is significant.
- The British Pound has had a significant but a small role since 1997.
- Latin America and East Asia remain focused on the dollar.
- Africa, Asia and Eastern Europe have increased their weight to the EUR in the currency basket.
- The role for the JPY is negligible today.
- Results vary across different regions of the world, with Africa and Asia re-weighting the basket to give Euro a greater role.
There is a rise in Euro as an international currency.

The decline of the dollar is significant.

The British Pound has had a significant but a small role since 1997.

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Results vary across different regions of the world, with Africa and Asia re-weighting the basket to give Euro a greater role.
There is a rise in Euro as an international currency.
The decline of the dollar is significant.
The British Pound has had a significant but a small role since 1997.
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Summary: Role of major currencies

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Research utilising the database

Example

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Weaknesses

- The range of $R^2$ that fall into the category of floating exchange rates is unclear.
- Choice of numeraire
- Choice of international currency.
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Features of database

1. Shift from a qualitative to a quantitative approach in estimating *de facto* exchange rate regime.
2. Consistency across countries and across time.
3. Inferential strategy for dates of structural change.
4. Quantification of exchange rate flexibility (rather than discrete unordered classification.)
5. Weights of various currencies in the basket.
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Classification is

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