Equilibrium Credit: *the Reference Point for Macroprudential Supervisors*

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Motivation

• Credit can help economic growth (Levine, 1997; Dell’Ariccia et al., 2012)

• Too much credit can become unproductive (Pagano 2012; Berkes et al., 2012) or counterproductive (Rogoff & Reinhart, 2009; Demirguc-Kunt & Detragiache, 2005)

• So we aim for not too much not too little credit. How to see whether the balance is right?

• Equilibrium credit: a forward-looking measure that allows countries achieve their development goals in a sustainable manner
Current Approaches

• **Structural**: Cottarelli et al. (2005), Egert et al. (2006)
• **Statistical**: Basel III (2011)

• Especially for EMDEs, statistical approaches could misgauge structural developments (intensity with which credit is used by the economy or intermediation capacity of the financial system)

• Statistical approaches also don’t allow calibration of equilibrium credit to internalize development goals set by policy makers (while taking into account associate systemic risk)
Our contribution

• A structural approach needed but not only in conditional mean, **elasticities are as important**

• **Supply side factors:** As countries develop so do payment systems, financing technologies (collateral frameworks), and credit risk management approaches (scoring models)

• **Demand side factors:** Use of credit by both business and consumers rises with economic development (Humprey et al., 2004; Derguc-Kunt & Klapper, 2012)

• **Institutional factors:** Regulatory framework & supervision can influence adjustments and volatility of credit cycles

• We propose a **two stage modeling framework** that allows for structural changes in both the conditional mean and elasticities of equilibrium credit
Theoretical Underpinnings

• Long-term equilibrium approach derived from quantity theory of money with credit playing similar role as money in modern economy (Humphrey et al., 2004; Lucas & Stokey, 1987; Mitchell-Innes, 1914)

\[ CR \times V = T \times P \]

\[ cr_t - (\beta^{gdp} gdp_t + \beta^{def} def_t) = v_t. \]

\[ v_t = \beta^{rr} rr_t + \beta^{sprd} sprd_t + \beta^{acb} acb_t \]

\[ cr_t - (\beta^{gdp} gdp_t + \beta^{def} def_t) = \beta^{rr} rr_t + \beta^{sprd} sprd_t + \beta^{acb} acb_t. \]

credit-to-GDP ratio if $\beta^{gdp}, \beta^{def} = 1$

credit velocity equation
Econometric Approach

- To empirically estimate this long-run equilibrium we employ co-integration approach by Pesaran et al. (1999)
- Eq (3) – “first stage estimating equation”

\[
\Delta c r_{it} = k_i + \alpha_i (cr_{i,t-1} - \beta_i' x_{it-1}) + \sum_{p=1}^{P} \pi_{pi} \Delta c r_{it-p} + \sum_{q=0}^{Q} \gamma_{qi} \Delta x_{it-q} + \epsilon_{it}
\]

\[
x_{it} = (gdp_{it} \enspace def_{it} \enspace rr_{it} \enspace sprd_{it} \enspace acb_{it})'.
\]

- Eq (4) – “second stage estimating equation”

\[
\zeta_i = \phi_0^m + \sum_{\ell=1}^{L} \phi_{\ell}^m z_{\ell i} + \epsilon_i, \quad \zeta_i = \{\hat{\beta}_{i}^{gdp}, \hat{\beta}_{i}^{def}, \hat{\alpha}\}
\]
Panel Data

- Maximum 118 observation for a country; minimum 25 observations (Bulgaria).
- Only 5 countries with less than 40 observations, 21 countries with 100 observations or more, and remaining countries have between 40 and 92 time-series observations.
- Total bank credit to private sector (IFS) converted to index with 100 at 2001:Q1.
## Table 1: Mean Group estimation results

<table>
<thead>
<tr>
<th>Parameter on Variable</th>
<th>Estimate</th>
<th>Std. error</th>
<th>t-statistic</th>
<th>p-value</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>GDP</td>
<td>2.9613***</td>
<td>0.3260</td>
<td>9.0833</td>
<td>0.0000</td>
<td>[2.3223, 3.6002]</td>
</tr>
<tr>
<td>GDP Deflator</td>
<td>0.2744</td>
<td>0.3161</td>
<td>0.8681</td>
<td>0.1927</td>
<td>[-0.3452, 0.8940]</td>
</tr>
<tr>
<td>Real interest rate</td>
<td>-0.0005</td>
<td>0.0090</td>
<td>-0.0528</td>
<td>0.4790</td>
<td>[-0.0181, 0.0171]</td>
</tr>
<tr>
<td>Lending to deposit spread</td>
<td>-0.0072</td>
<td>0.0120</td>
<td>-0.5998</td>
<td>0.2743</td>
<td>[-0.0308, 0.0164]</td>
</tr>
<tr>
<td>Alternative cost of borrowing</td>
<td>-0.0029**</td>
<td>0.0013</td>
<td>-2.2184</td>
<td>0.0133</td>
<td>[-0.0056, -0.0003]</td>
</tr>
<tr>
<td>Error correction term</td>
<td>-0.1631***</td>
<td>0.0235</td>
<td>-6.9381</td>
<td>0.0000</td>
<td>[-0.2092, -0.1170]</td>
</tr>
<tr>
<td>Intercept term</td>
<td>-1.8644***</td>
<td>0.2887</td>
<td>-6.4573</td>
<td>0.0000</td>
<td>[-2.4304, -1.2985]</td>
</tr>
</tbody>
</table>

### Distribution of Parameters

(a) Distribution of $\hat{\beta}^{xgp}$  
(b) Distribution of $\hat{\beta}^{xgp}$  
(c) Distribution of $\hat{\beta}^{xdef}$  
(d) Distribution of $\hat{\alpha}$
Cross-Section Data

• Cross sectional data have 49 observations
• Supply, demand, and institutional factors taken from:
  - FinStats (Al-Hussainy et al., 2010 & Beck et al., 2000); World Bank Central Database (2011);
  Kaufmann et al. (2010); Melecky and Podpiera (2012); Laeven and Valencia (2012)
• 42 potential regressors – Bayesian variable selection to reduce them to 15-20 best regressors, and further regression with efficiency penalty to select the most important ones.
Elasticity of Credit to GDP

- **Supply**: Financial depth (+); Crisis experience (+)
- **Demand**: Number of branches (-);
- **Institutional**: CB financial and political independence (-); Integrated prudential supervision (-); ECA region (+).
Elasticity of Credit to Prices (GDP deflator)

- **Supply:** Cost-to-income (+); Crisis experience (+).
- **Demand:** Number of branches (+); local debt securities to GDP (-);
- **Institutional:** CB financial and political independence (+); Integrated prudential supervision (+);
Speed of Credit Adjustment to Equilibrium

- **Supply:** Foreign claims of BIS reporting banks (-)
- **Demand:** Number of branches (+); Equity assets to GDP (+).
- **Institutional:** CB political independence (+); ECA region (-).
Important Structural Determinants: *Summary*

- **Supply side:** financial depth; efficiency and funding of domestic banks; and the experience of a banking crisis.
- **Demand side:** access to financial services; and use of capital markets.
- **Institutional factors:** central bank independence; and the degree of supervisory integration.
- Countries in Europe and Central Asia show a slower adjustment speed of actual credit to its long-run equilibrium.
Conclusions

• Countries have much to lose if they focus too intensely on financial stability and overly restrict credit provision to the real economy in the medium to long-term.

• The filtered credit-to-GDP ratio of Basel III fails to adequately account for shifts in equilibrium credit due to changing development factors.

• Various development factors, beyond simply financial depth, drive these shifts—the story is more nuanced than just financial deepening as e.g. in Egert et al., 2006

• This paper’s framework can help policymakers strike a better balance between financial development and stability in their macroprudential supervision.
Further Work

- Working out an example: in-sample, and out-of-sample taking into account development goals of a given country
- Enriching the set of possible demand side factors with Findex data, enterprise survey data (DB?)
- Estimating trigger points, i.e. significant deviations from equilibrium credit which call for interventions of macroprudential policy
Thank you!

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