

Equilibrium Credit: *the Reference Point for Macprudential 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)

$$CR \times V = T \times P$$

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

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

$$\underbrace{cr_t - (\beta^{gdp} gdp_t + \beta^{def} def_t)}_{\text{credit-to-GDP ratio if } \beta^{gdp}, \beta^{def}=1} = \underbrace{\beta^{rr} rr_t + \beta^{sprd} sprd_t + \beta^{acb} acb_t}_{\text{credit velocity equation}}.$$

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”

$$\Delta cr_{it} = k_i + \alpha_i(cr_{it-1} - \beta'_i x_{it-1}) + \sum_{p=1}^P \pi_{pi} \Delta cr_{it-p} + \sum_{q=0}^Q \gamma'_{qi} \Delta x_{it-q} + \epsilon_{it}$$

$$x_{it} = (gdp_{it} \ def_{it} \ rr_{it} \ sprd_{it} \ acb_{it})'$$

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

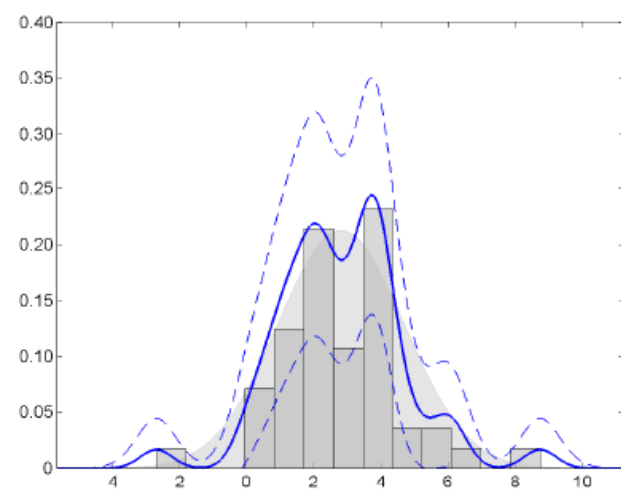
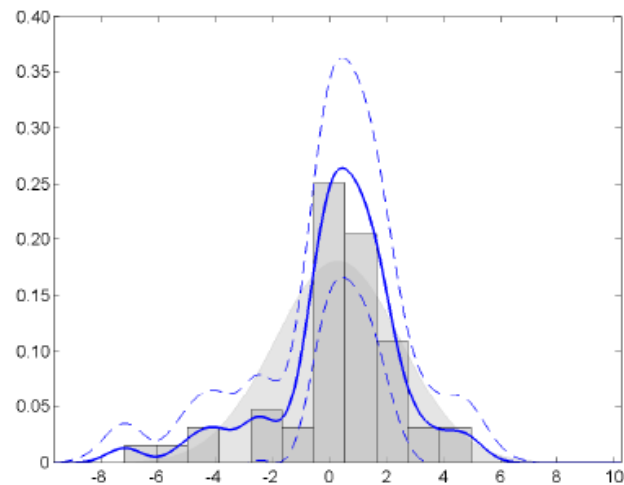
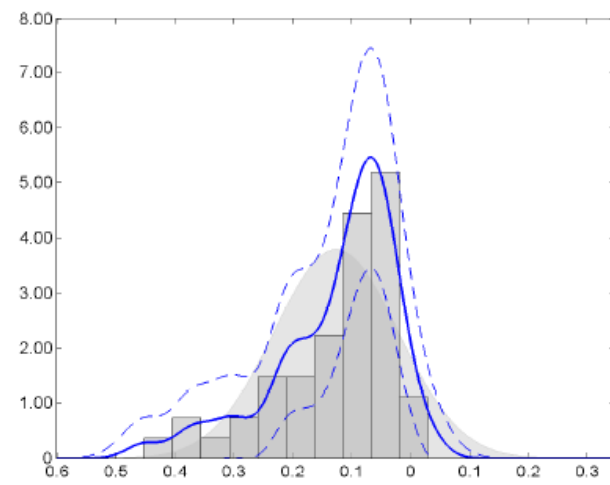
$$\tilde{\zeta}_i = \phi_0^m + \sum_{\ell=1}^L \phi_\ell^m z_{\ell i} + \epsilon_i, \quad \tilde{\zeta}_i = \{\hat{\beta}_i^{gdp}, \hat{\beta}_i^{def}, \hat{\alpha}\}$$

Panel Data

- 49 countries from 1980:Q1 to 2010:Q3.
- 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

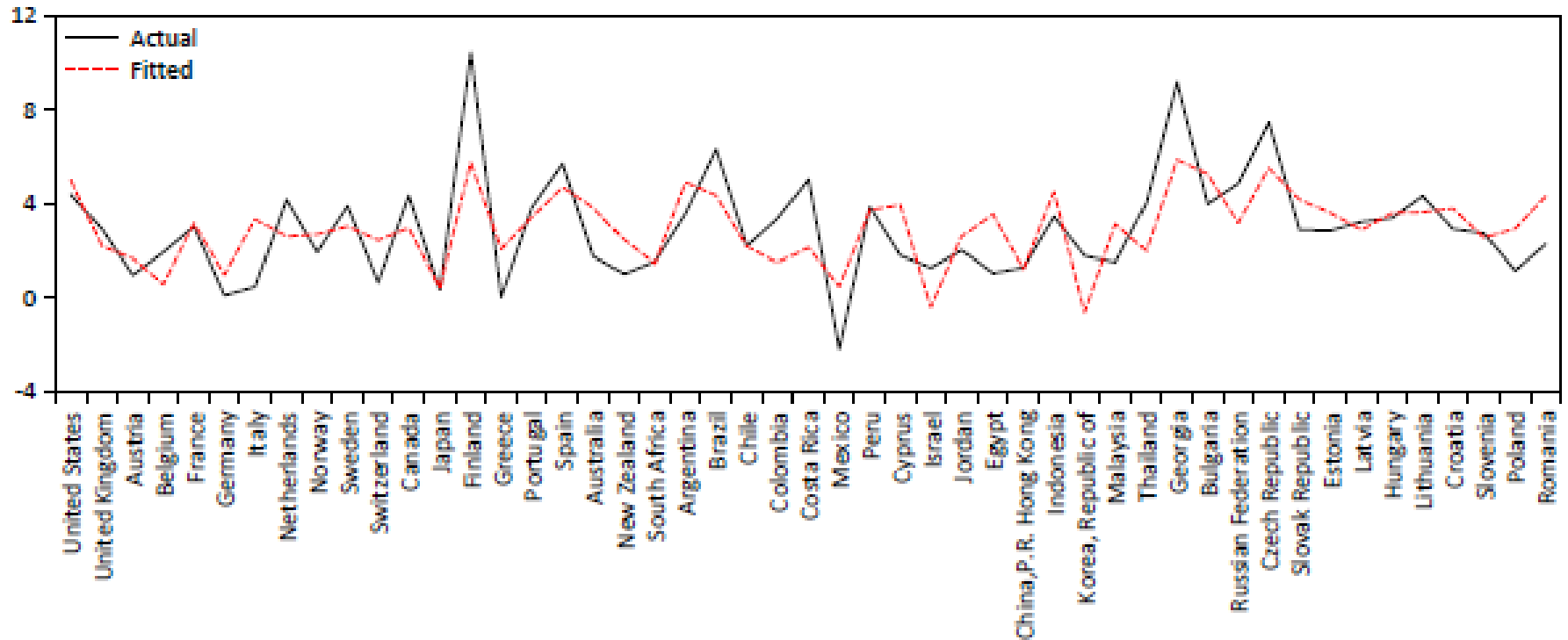
Parameter on Variable:	Estimate	Std. error	<i>t</i> -statistic	<i>p</i> -value	95% CI
GDP	2.9613***	0.3260	9.0833	0.0000	[2.3223, 3.6002]
GDP Deflator	0.2744	0.3161	0.8681	0.1927	[-0.3452, 0.8940]
Real interest rate	-0.0005	0.0090	-0.0528	0.4790	[-0.0181, 0.0171]
Lending to deposit spread	-0.0072	0.0120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

(a) Distribution of $\hat{\beta}^{gdp}$ (c) Distribution of $\hat{\beta}^{def}$ (e) Distribution of \hat{a}

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.

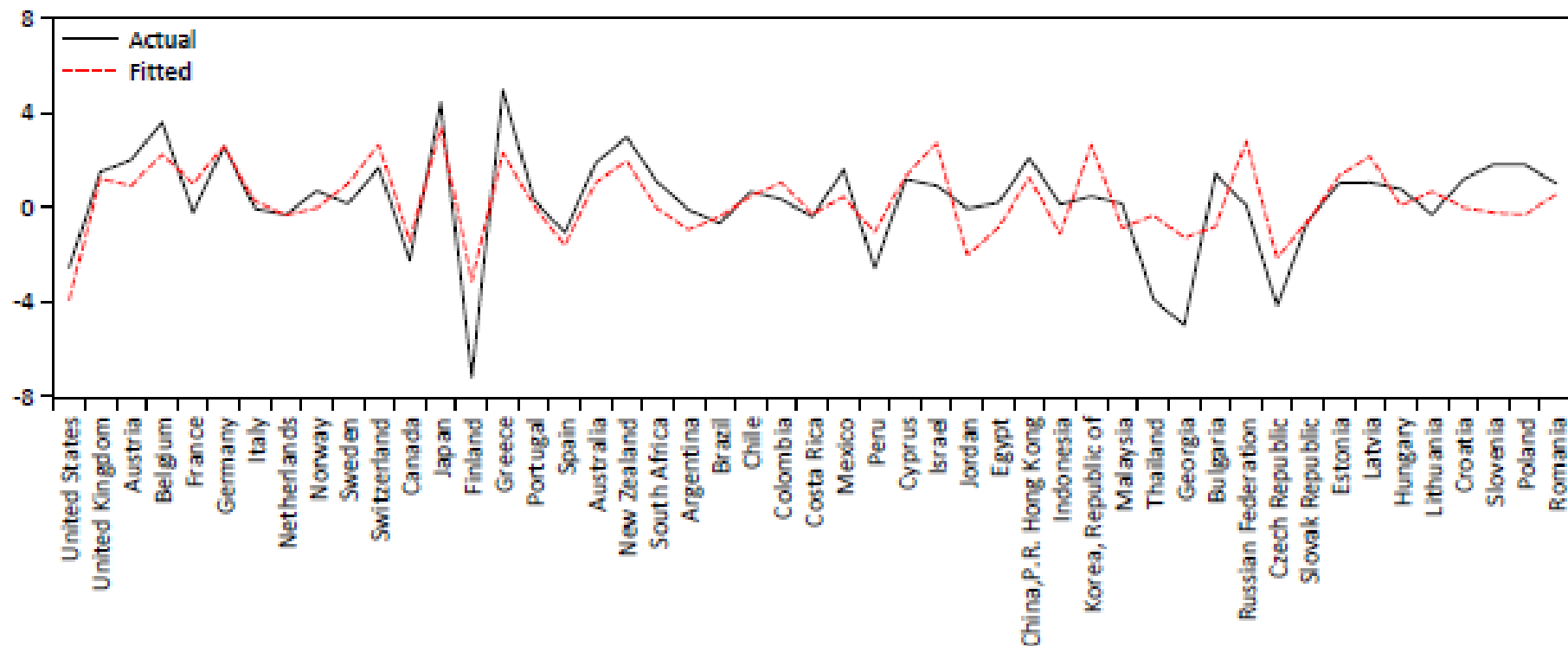
Elasticity of Credit to GDP



(a) Actual and fitted values of β_{gdp}

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

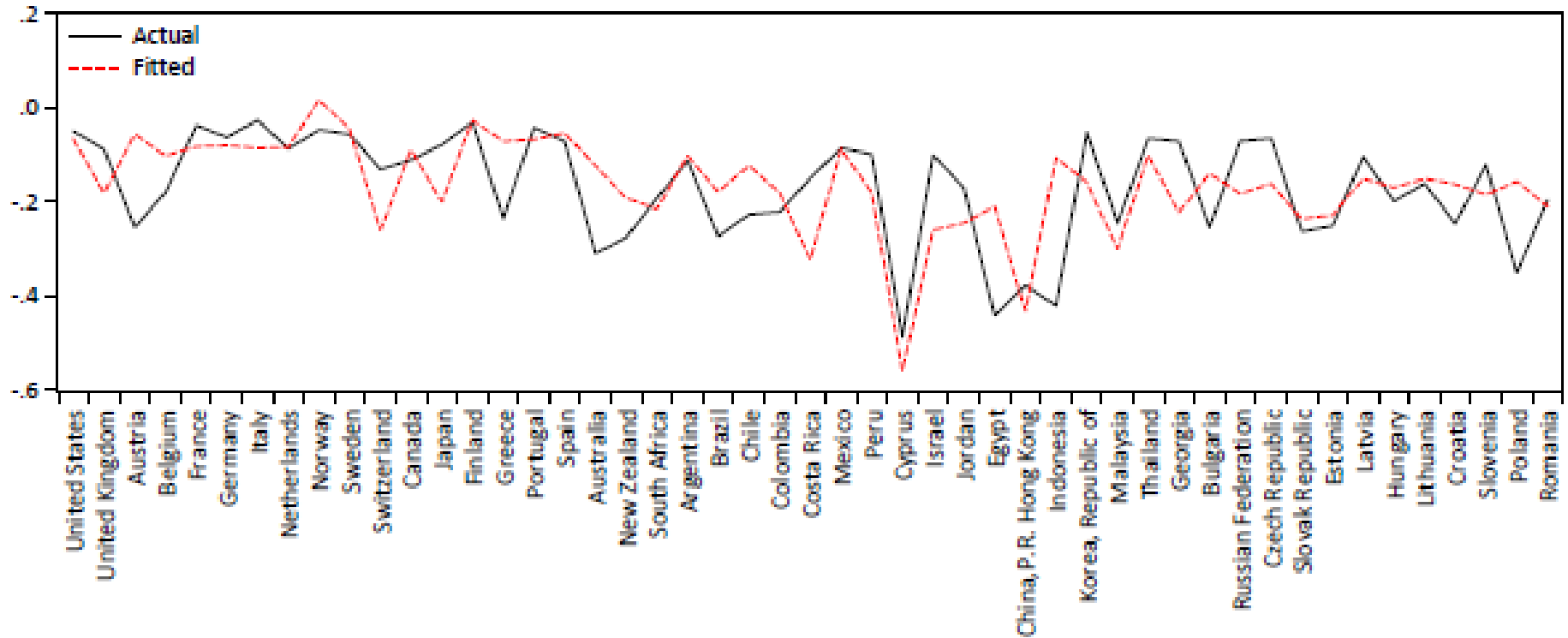
Elasticity of Credit to Prices (GDP deflator)



(b) Actual and fitted values of β^{def}

- **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



(c) Actual and fitted values of δ

- **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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