

What do we do about (Macro) Pru? Macro Prudential Policy and Credit;

**Ray Barrell and Dilruba Karim,
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Regulation and the Countercyclical Buffer

Table 1 Capital requirements and buffers (all numbers in per cent)

	Common equity (after deductions)	Tier 1 capital	Total capital
Minimum	4.5	6.0	8.0
Conservation buffer	2.5		
Minimum + conservation buffer	7.0	8.5	10.5
Countercyclical buffer range	0-2.5		

Issues to Address

- Why is the countercyclical buffer present
 - Signal extraction methods over heterogeneous countries suggest credit to GDP matters
 - BIS suggest calibrating off an HP filtered credit to GDP Gap and present evidence
- How should we calibrate the buffer
 - What affects crises
 - Can the authorities control them
 - What are the costs and benefits of control

Predicting crises

- It is common to use a logit model

$$\text{Prob}(Y_{it} = 1) = F(\beta X_{it}) = \frac{e^{\beta X_{it}}}{1 + e^{\beta X_{it}}}$$

- We need to choose explanatory variables
 - Those from the EWS literature
 - New variables introduced by Barrell
- Use data 1980 to 2010
- Use World Bank and IMF definitions of crises to ensure comparability with others

Strategy to investigate credit

- OECD Panel and La and EA panels
 - Cannot pool because capital data in LA/EA is risk weighted and OECD not
 - Three panels for each with common variables and lags for comparability
 - Credit to GDP Gap
 - Credit to GDP ratio
 - Credit to GDP growth
- Looking for a parsimonious panel
 - Variables are not controls
 - We have competing hypotheses
 - We need to address treatment strategies

OECD Credit to GDP Gap

	1	2	3	4	5	6	7	8
Liquidity Ratio(-2)	-0.11 (0.007)	-0.111 (0.007)	-0.115 (0.006)	-0.115 (0.006)	-0.137 (0)	-0.154 (0)	-0.155 (0)	-0.142 (0)
Capital Adequacy Ratio(-2)	-0.281 (0.004)	-0.294 (0.001)	-0.281 (0.001)	-0.272 (0.002)	-0.263 (0.002)	-0.277 (0.001)	-0.258 (0.002)	-0.193 (0.005)
Current Account Balance (% of GDP)(-2)	-0.222 (0.007)	-0.229 (0.004)	-0.243 (0.003)	-0.257 (0.001)	-0.242 (0.003)	-0.215 (0.005)	-0.216 (0.005)	-0.2 (0.008)
Δ GDP(-2)	0.179 (0.209)	0.177 (0.217)	0.147 (0.283)	0.197 (0.113)	0.22 (0.068)	0.214 (0.069)	0.185 (0.116)	
Credit to GDP Gap(-2)	3.868 (0.192)	3.718 (0.204)	3.415 (0.241)	3.69 (0.195)	3.993 (0.164)	3.685 (0.199)		
Inflation(-2)	-0.101 (0.197)	-0.1 (0.202)	-0.097 (0.215)	-0.085 (0.258)	-0.08 (0.286)			
Budget Balance (% of GDP)(-2)	0.054 (0.431)	0.058 (0.386)	0.061 (0.362)	0.073 (0.267)				
Δ Domestic Credit(-2)	0.041 (0.372)	0.04 (0.384)	0.038 (0.406)					
Exchange Rate(-2)	-0.006 (0.404)	-0.007 (0.386)						
M2 Money/ Forex Reserves(-2)	0 (0.736)							

OECD Credit to GDP ratio

Regression Number	1	2	3	4	5	6	7	8
Liquidity Ratio(-2)	-0.119 (0.005)	-0.119 (0.005)	-0.122 (0.004)	-0.139 (0.001)	-0.128 (0.001)	-0.132 (0.001)	-0.155 (0)	-0.142 (0)
Capital Adequacy Ratio(-2)	-0.326 (0.004)	-0.337 (0.002)	-0.337 (0.002)	-0.351 (0.001)	-0.28 (0.001)	-0.271 (0.001)	-0.258 (0.002)	-0.193 (0.005)
Current Account Balance (% of GDP)(-2)	-0.24 (0.004)	-0.246 (0.003)	-0.262 (0.002)	-0.238 (0.002)	-0.222 (0.004)	-0.233 (0.002)	-0.216 (0.005)	-0.2 (0.008)
Δ GDP(-2)	0.128 (0.364)	0.129 (0.366)	0.171 (0.197)	0.167 (0.196)	0.185 (0.144)	0.163 (0.179)	0.185 (0.116)	
Budget Balance (% of GDP)(-2)	0.073 (0.297)	0.077 (0.268)	0.089 (0.185)	0.084 (0.203)	0.071 (0.259)	0.073 (0.251)		
Exchange Rate(-2)	-0.01 (0.265)	-0.01 (0.275)	-0.011 (0.235)	-0.011 (0.244)	-0.005 (0.471)			
Domestic Credit/ GDP(-2)	0.543 (0.327)	0.48 (0.369)	0.589 (0.256)	0.582 (0.259)				
Inflation(-2)	-0.089 (0.243)	-0.088 (0.248)	-0.076 (0.297)					
Δ Domestic Credit(-2)	0.037 (0.442)	0.037 (0.443)						
M2 Money/ Forex Reserves(-2)	0 (0.679)							

OECD Credit to GDP Growth

Regression Number	1	2	3	4	5	6	7	8
Liquidity Ratio(-2)	-0.112 (0.006)	-0.113 (0.006)	-0.11 (0.007)	-0.114 (0.006)	-0.107 (0.007)	-0.126 (0)	-0.145 (0)	-0.142 (0)
Capital Adequacy Ratio(-2)	-0.287 (0.004)	-0.289 (0.002)	-0.281 (0.002)	-0.271 (0.002)	-0.245 (0.002)	-0.236 (0.003)	-0.248 (0.001)	-0.193 (0.005)
Current Account Balance (% of GDP)(-2)	-0.226 (0.006)	-0.228 (0.004)	-0.228 (0.005)	-0.241 (0.003)	-0.23 (0.003)	-0.213 (0.006)	-0.187 (0.011)	-0.2 (0.008)
Δ Domestic Credit/GDP(-2)	0.053 (0.347)	0.053 (0.349)	0.048 (0.299)	0.046 (0.319)	0.061 (0.144)	0.072 (0.07)	0.06 (0.109)	
Inflation(-2)	-0.06 (0.46)	-0.06 (0.463)	-0.091 (0.232)	-0.09 (0.241)	-0.093 (0.219)	-0.095 (0.212)		
Budget Balance (% of GDP)(-2)	0.064 (0.337)	0.065 (0.326)	0.063 (0.345)	0.065 (0.329)	0.067 (0.308)			
Δ GDP(-2)	0.136 (0.342)	0.136 (0.343)	0.132 (0.349)	0.109 (0.42)				
Exchange Rate(-2)	-0.005 (0.479)	-0.005 (0.474)	-0.006 (0.44)					
Δ Domestic Credit(-2)	-1.355 (0.731)	-1.372 (0.727)						
M2 Money/ Forex Reserves(-2)	0 (0.957)							

OECD Crises

- In each case we end up with the same OECD model from different starting points
- There are some Macro-Pru lessons to learn – perhaps there is a role for growth of credit to GDP
- We need to look at the process of model selection by looking at ROC curves and Area Under Curve indicators

LA and EA Credit Gap

	1	2	3	4	5	6	7	8
Liquidity Ratio(-2)	-0.054 (0.001)	-0.055 (0.001)	-0.049 (0.001)	-0.049 (0)	-0.048 (0)	-0.048 (0)	-0.048 (0)	-0.054 (0)
Capital Adequacy Ratio(-2)	-0.176 (0.003)	-0.175 (0.002)	-0.213 (0)	-0.226 (0)	-0.224 (0)	-0.227 (0)	-0.242 (0)	-0.249 (0)
Current Account Balance (% of GDP)(-2)	-0.095 (0.048)	-0.094 (0.042)	-0.082 (0.06)	-0.079 (0.067)	-0.08 (0.063)	-0.078 (0.068)	-0.07 (0.084)	-0.08 (0.057)
Exchange Rate(-2)	0 (0.285)	0 (0.283)	-0.001 (0.236)	-0.001 (0.217)	-0.001 (0.216)	-0.001 (0.209)	-0.001 (0.176)	
Δ GDP(-2)	-0.054 (0.306)	-0.053 (0.29)	-0.034 (0.486)	-0.034 (0.48)	-0.039 (0.412)	-0.032 (0.488)		
Credit to GDP Gap(-2)	-0.046 (0.369)	-0.046 (0.365)	-0.037 (0.435)	-0.037 (0.425)	-0.038 (0.42)			
Inflation(-2)	0 (0.555)	0 (0.553)	0 (0.544)	0 (0.559)				
M2 Money/ Forex Reserves(-2)	-0.048 (0.368)	-0.049 (0.351)	-0.024 (0.61)					
Δ Domestic Credit(-2)	0 (0.82)	0 (0.825)						
Budget Balance (% of GDP)(-2)	0.007 (0.938)							

LA and EA Credit to GDP ratio

Regression Number	1	2	3	4	5	6	7
Liquidity Ratio(-2)	-0.053 (0.002)	-0.053 (0.002)	-0.047 (0.002)	-0.047 (0.002)	-0.046 (0.002)	-0.049 (0)	-0.052 (0)
Domestic Credit/ GDP(-2)	-0.019 (0.027)	-0.019 (0.017)	-0.019 (0.015)	-0.019 (0.012)	-0.019 (0.011)	-0.018 (0.012)	-0.021 (0.003)
Capital Adequacy Ratio(-2)	-0.11 (0.076)	-0.108 (0.075)	-0.13 (0.03)	-0.132 (0.027)	-0.131 (0.027)	-0.128 (0.026)	-0.12 (0.032)
Current Account Balance (% of GDP)(-2)	-0.11 (0.04)	-0.11 (0.04)	-0.099 (0.053)	-0.098 (0.05)	-0.097 (0.05)	-0.088 (0.066)	-0.097 (0.05)
Exchange Rate(-2)	0 (0.434)	0 (0.435)	0 (0.387)	0 (0.363)	0 (0.358)	0 (0.344)	
Budget Balance (% of GDP)(-2)	0.08 (0.438)	0.076 (0.444)	0.063 (0.508)	0.06 (0.512)	0.059 (0.521)		
Inflation(-2)	0 (0.635)	0 (0.629)	0 (0.619)	0 (0.585)			
Δ GDP(-2)	-0.027 (0.621)	-0.027 (0.625)	-0.006 (0.906)				
Δ Domestic Credit(-2)	0 (0.886)	0 (0.895)					
M2 Money/ Forex Reserves(-2)	0.007 (0.891)						

LA and EA Credit to GDP Growth

Regression Number	1	2	3	4	5	6
Capital Adequacy Ratio(-2)	-0.163 (0.005)	-0.162 (0.005)	-0.161 (0.005)	-0.166 (0.003)	-0.181 (0.001)	-0.179 (0.001)
Δ Domestic Credit/ GDP(-2)	0.06 (0.036)	0.059 (0.037)	0.061 (0.032)	0.062 (0.026)	0.06 (0.034)	0.064 (0.026)
Liquidity Ratio(-2)	-0.054 (0.004)	-0.054 (0.003)	-0.054 (0.003)	-0.055 (0.002)	-0.05 (0.003)	-0.052 (0.002)
M2 Money/ Forex Reserves(-2)	-0.167 (0.031)	-0.167 (0.03)	-0.167 (0.03)	-0.172 (0.023)	-0.164 (0.03)	-0.193 (0.011)
Current Account Balance (% of GDP)(-2)	-0.082 (0.098)	-0.082 (0.098)	-0.082 (0.101)	-0.076 (0.106)	-0.082 (0.069)	-0.091 (0.05)
Exchange Rate(-2)	0 (0.392)	0 (0.379)	0 (0.377)	0 (0.363)	0 (0.365)	
Budget Balance (% of GDP)(-2)	-0.05 (0.633)	-0.051 (0.628)	-0.052 (0.624)	-0.067 (0.485)		
Δ GDP(-2)	-0.017 (0.76)	-0.017 (0.758)	-0.019 (0.731)			
Inflation(-2)	0 (0.798)	0 (0.788)				
Δ Domestic Credit(-2)	0 (0.854)					

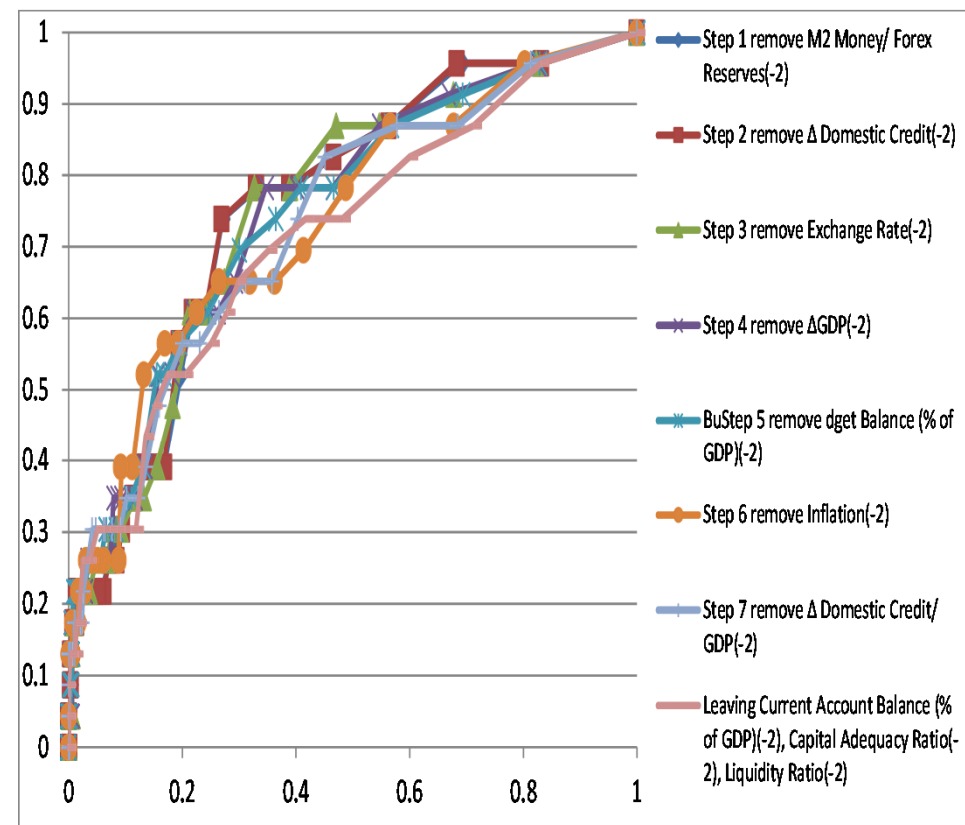
Lessons from LA and EA

- Three different starting points give three different answers
 - We have to have a method for choosing between models
- There does appear to be a role for credit to GDP but it is not the credit gap
 - What is the role of financial liberalisation
 - Role for exchange rate through reserves
- LA and EA look different from OECD

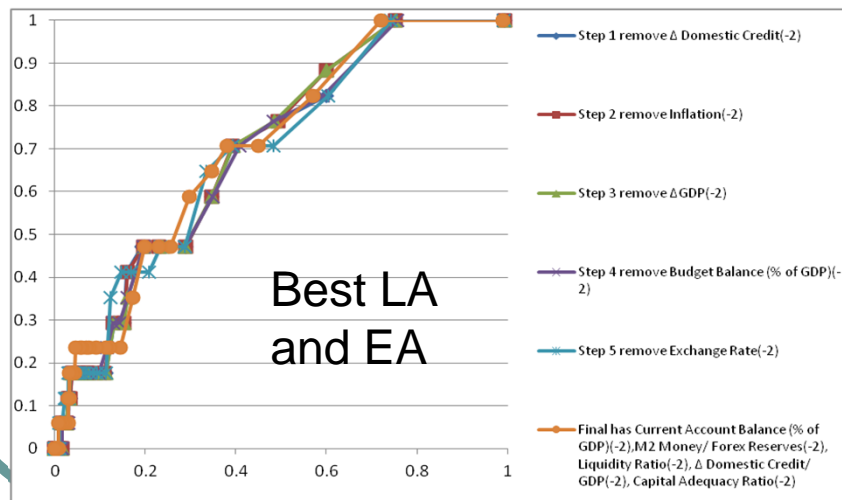
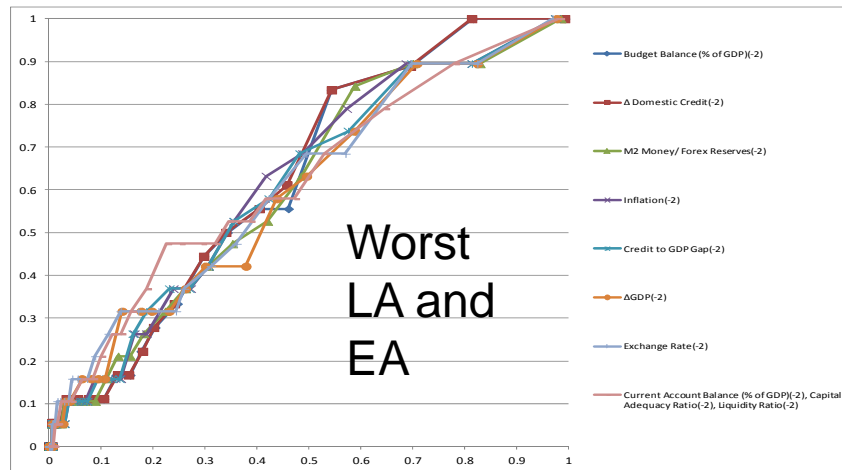
What is a ROC Curve?

- A good call is when a crisis happens at the threshold set (LHS)
- A false call is model probability exceeds threshold and no crisis (bottom)
- A good ROC has high good calls and low false calls

Best OECD Model evolution



What is an Area Under the Curve



- Within models curves could dominate but we have continual cross over
- When curves cross there is more signal in AUC with a bigger area under it
- Compare models by looking at the AUC which must be better than a coin toss

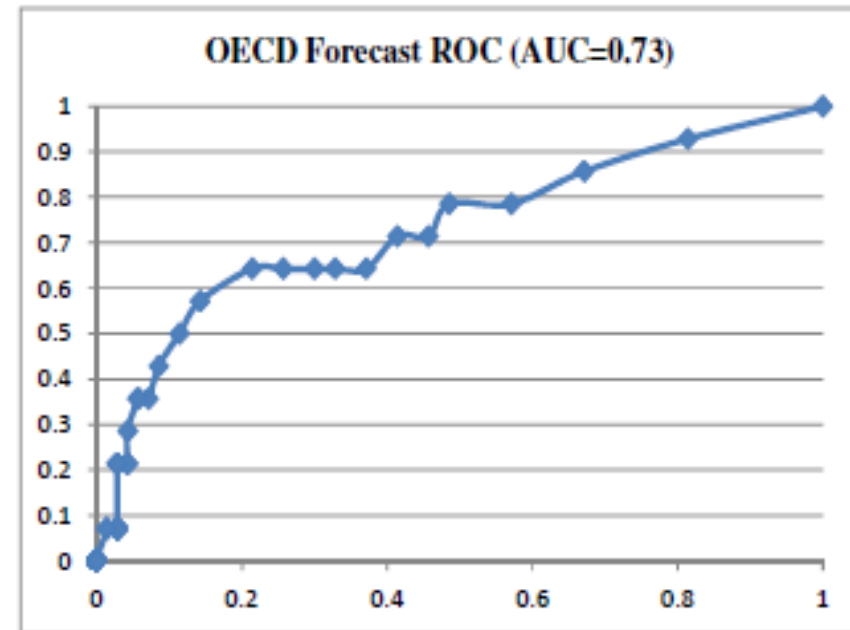
Comparing AUCs

- Over 70 is acceptable, over 80 very good
- Only Credit growth useful for LA and EA

Regression Number	1	2	3	4	5	6	7	8
OECD <i>Credit to GDP Gap</i>	0.76	0.76	0.76	0.75	0.75	0.74	0.74	0.72
OECD <i>Credit to GDP Ratio</i>	0.76	0.76	0.75	0.75	0.75	0.74	0.74	0.72
OECD <i>Credit to GDP Growth</i>	0.76	0.76	0.76	0.75	0.75	0.74	0.74	0.72
LA and EA <i>Credit to GDP Gap</i>	0.63	0.63	0.60	0.60	0.59	0.58	0.59	NA
LA and EA <i>Credit to GDP Ratio</i>	0.64	0.64	0.62	0.62	0.63	0.63	0.63	NA
LA and EA <i>Credit to GDP Growth</i>	0.69	0.70	0.70	0.69	0.69	0.70	NA	NA

Forecast Evaluation

- The OECD model performs well out of sample, calling
 - Germany (2009),
 - Denmark (2009),
 - Spain (2011)
- False call only in Denmark (2008) and Spain (2008)



Public Health and Signal Extraction

- Distinction between immunisation programmes to reduce probability of event and diagnostic programmes that trigger a response
 - For immunisation we need significant drivers and indications on tools we can use effectively
 - For diagnostics driven response we can use Signal Extraction or controls based Logit, but we need to show which is best
- Macro Pru is about preparing in advance with capital and liquidity as tools
 - Levels of tools can be driven by indicators that show potential emerging problems with in the financial sector
 - The countercyclical buffer may be diagnostic

What should we do?

- Evidence on role of credit as driving factor weak
 - heterogeneous samples are misleading
 - Signal extraction is biased and unscientific
- The Countercyclical buffer is likely to be counterproductive
 - It is not supported by Spanish experience
 - There is no evidence to suggest it will reduce the incidence of financial crises or stress
- Condition against things relevant for problem –
 - house prices, current accounts, OBS in deregulated markets
 - credit growth, current account, currency problems in others