



BANK FOR INTERNATIONAL SETTLEMENTS

Does sovereign risk in local and foreign currency differ?

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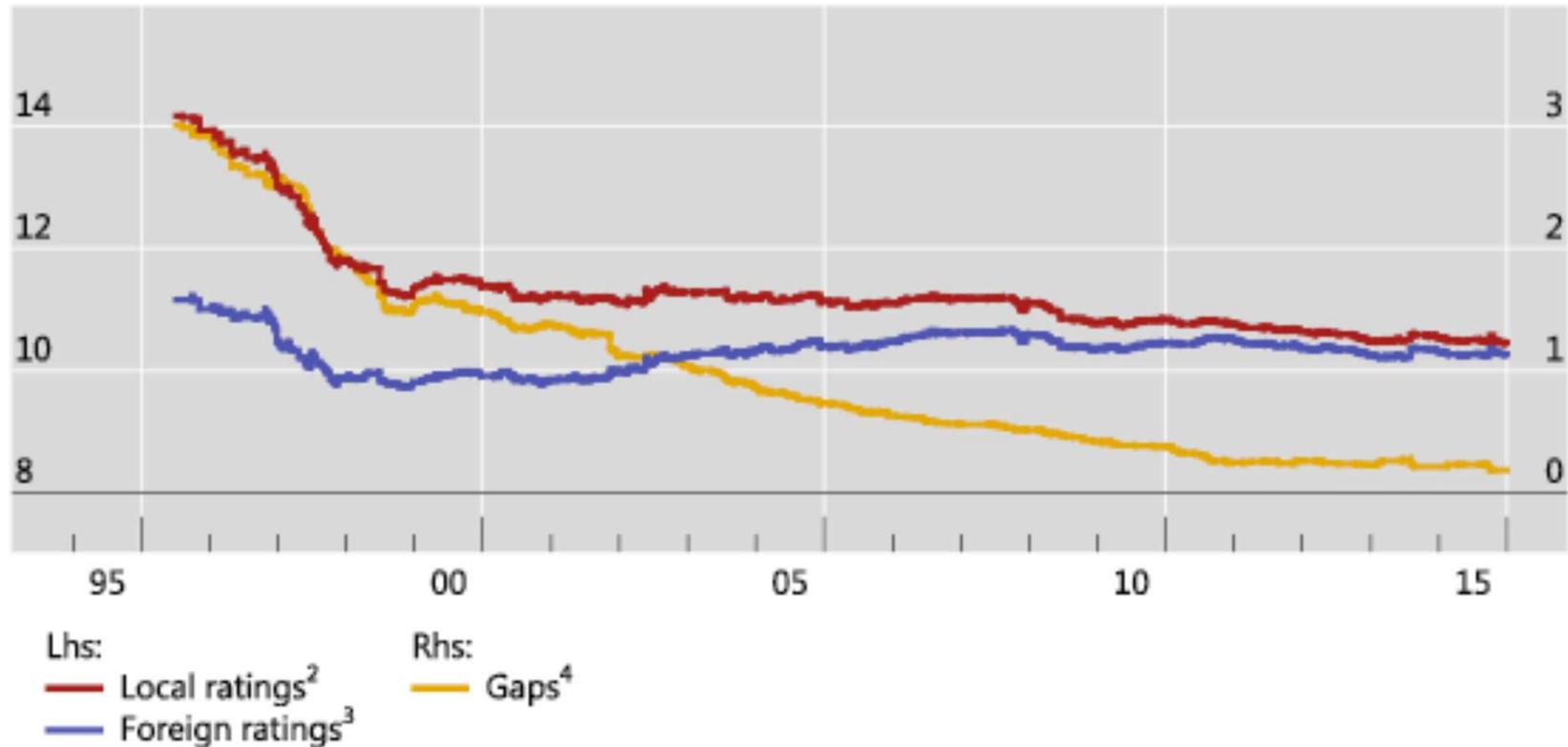
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Agenda and Summary

- Answer in a **plot**: “Yes, it differs – but (so far) less and less”
- Why should we care? For academic and policy reasons
- **5 hypothesis**: all about inflation?
- The choice of **data set**: broad panel on EME
- 3 sub-questions: separate FC vs LC / gap regression / quant. impact
- Conclusions:
 - FC reacts stronger to: **FX reserves, local bond market development, and global volatility.**
 - LC reacts stronger to: **bank exposure to public debt (doom-loop).**
 - FC and LC react the same to the usual suspect (inflation).
 - Recent decreasing difference: mostly due to **FX reserves.**

Credit risk of debt differs with currency denomination



- Debt in local currency is considered as less risky than debt in foreign currency
- The difference – hereafter “the gap” - diminishes over time.

Motivation – why it matters

Academic interest

- Is the **traditional view** correct?
 - Local currency sovereign debt safer as it can be **monetized**.
- Increasing recognition that world is **more complicated**:
 - Frequency of default no longer obviously different
 - Costs of higher inflation not always less than default
 - Incentives likely depend on the relative development of the local versus foreign currency markets
 - Costs to domestic banking system another consideration

Policy interest

- Risk weightings of sovereign exposures in **prudential regulation**
- **Rapid growth of local currency**, FX swap, CDS markets raises the importance of distinguishing the risks

Five hypotheses: why FC might differ from LC

- **Inflation** hypothesis (H1): Higher inflation
 - **lowers** sovereign creditworthiness
 - but **less so for domestic currency debt**
 - thus **increasing** the gap.
- **Reserves** hypothesis (H2): High FX reserves (over GDP)
 - **increases** creditworthiness,
 - but **more so for foreign currency obligations**
 - thus **diminishing** the gap.
- **Original sin** hypothesis (H3): the greater international debt financing in local currency
 - **raises** sovereign creditworthiness
 - **more so for foreign currency obligations**
 - thus **diminishing** the gap.

Five hypotheses: why FC might differ from LC

- **Banking sector exposure** hypothesis (H4): Greater exposure of the banking sector to government bonds
 - **decreases** sovereign creditworthiness, because of the mutual reinforcement of sovereign and financial system risk (the “doom loop”)
 - Since this influence is expected to **affect local currency obligations more strongly**
 - banking sector exposure to sovereign risk will **decrease** the gap.
- **Global Volatility Hypothesis (H5)**: High global volatility (as measured by VIX)
 - **lowers** sovereign creditworthiness and
 - **more so for foreign currency** obligation
 - thus **increasing** the gap.

In sum: what lowers the gap...

1. lower **inflation** (+)
 - debt monetization potential when inflation high **hurts FC more**.
2. higher **foreign exchange reserves** (−)
 - readily available foreign exchange **lifts FC more**
3. better developed **local currency markets** (−)
 - diminished currency mismatch **lifts FC more**
4. greater **banking system exposure to government debt** (−)
 - higher likelihood of “doom loop” **hurts LC more**
(system can become more fragile (Acharya et al, 2014))
5. lower **global volatility** (+)
 - greater insulation of domestic markets **hurts FC more**

Ratings determinants - *control variables*

We focus on the usual suspects and are guided by Jeanneret and Souissi (2016), Amstad and Packer (2015) and others:

Country specific factors

- economic strength (wealth; growth)
- fiscal strength (debt, interest coverage)
- institutional strength (corruption)
- exchange rate regime
- default history

Relevant Literature (1)

- Default literature:
 - Identification of **stylised fact** that local currency defaults are common (Reinhart and Rogoff (2009))
 - Estimation of the different factors that determine FC vs. LC defaults (Jeanneret and Souissi (2016)):
 - High **inflation** makes local currency default more likely, **importance of banking** makes local currency default less likely (consistent with Gennaioli et al (2014)).
 - Level of indebtedness, domestic investment, short-term external debt make foreign currency default more likely. Contagion is limited, original sin, global factors do not matter
- Global volatility and sovereign risk:
 - **Global volatility** well established as significant determinants of market measures of credit risk (Amstad et al (2016) and others).
 - **Global volatility** tend to impact measures of foreign currency risk more than local currency (Du and Schragger (2016)).

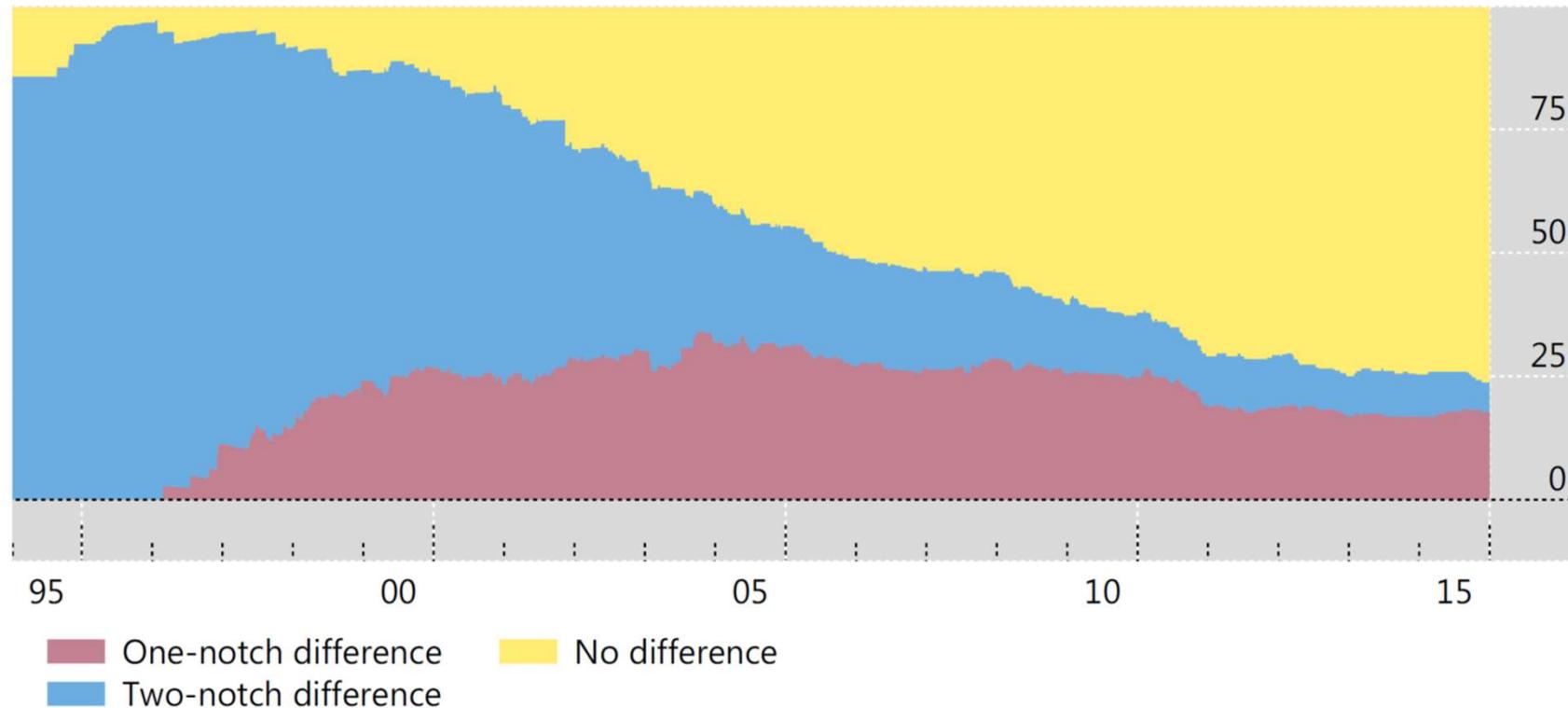
Relevant Literature (2)

- Empirical Ratings Literature
 - Transform sovereign credit ratings into linear variable as measure of sovereign risk
 - To identify determinants of ratings (Cantor-Packer(1996), others)
 - To **test theories of sovereign risk** (Eichengreen, Hausman and Panizza, 2003, others)
 - Examine drivers of difference in foreign vs. local currency ratings (Kisselev-Packer 2006)
 - Higher inflation affected local ratings more than foreign
 - Monetary expansion (M2) is associated with safer local currency obligations.
 - Did not test banking credit or bond market development as differential factors, no updates since the global financial crisis

Broad sample including pre and post crisis regime

- Ratings
 - measure used by **investors** and **regulators**
 - **consistently** available for **large** data set
 - unaffected by capital market frictions
- Average of S&P, Moody's and Fitch
- Annual data from **1996 to 2015** (take ratings from year-end)
- **73 emerging market economies** for which we can obtain both foreign and local currency sovereign ratings from at least one of the three major agencies at some point

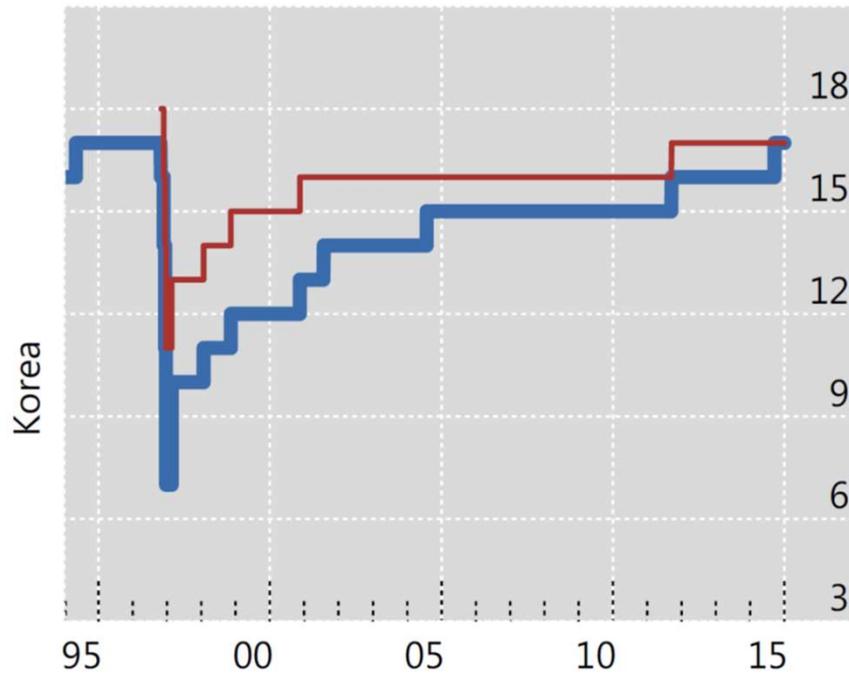
Ratings gaps: frequency of outcome



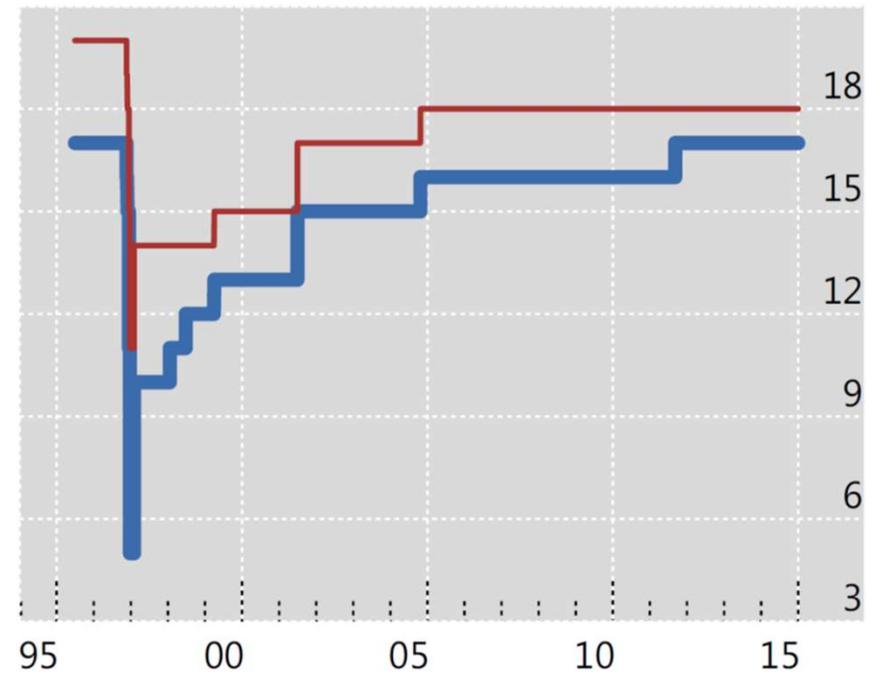
Note: the number of sovereigns with both foreign and local currency ratings grew significantly in the 1990s and early 2000s.

The example of South Korea

S&P



Fitch



Three (sub)-questions

- What determines FC and LC sovereign credit risk?
Two separate multinomial ordered logit

$$\Pr((y^{F_{i,t}}) \text{ in each of 19 foreign rating categories}) = F(X_{i,t}^{\text{hypothesis}}, X_{i,t}^{\text{control}})$$

$$\Pr((y^{L_{i,t}}) \text{ in each of 19 local rating categories}) = F(X_{i,t}^{\text{hypothesis}}, X_{i,t}^{\text{control}})$$

- What drives the gap? Trinomial ordered logit

$$\Pr((y^{L_{i,t}} - y^{F_{i,t}} \leq 0) = F(X_{i,t}^{\text{hypothesis}}, X_{i,t}^{\text{control}})$$

$$\Pr((y^{L_{i,t}} - y^{F_{i,t}} > 0) \text{ and } \Pr((y^{L_{i,t}} - y^{F_{i,t}} < 2 \text{ notches}) = F(X_{i,t}^{\text{hypothesis}}, X_{i,t}^{\text{control}})$$

$$\Pr((y^{L_{i,t}} - y^{F_{i,t}} \geq 2 \text{ notches}) = F(X_{i,t}^{\text{hypothesis}}, X_{i,t}^{\text{control}})$$

- Which factors might explain the declining gap?

Foreign and Local Currency Ratings Regressions: Multinomial logit, country fixed effects

	Foreign currency		Local currency		
Inflation	-0.056***	(-3.72)	-0.103***	(-3.75)	
FX reserves	0.072***	(6.22)	0.052***	(3.15)	(+)
Development LC market	2.888***	(5.98)	1.067*	(1.87)	(+)
Bank holdings public debt	-0.024***	(-4.24)	-0.033***	(-4.38)	(+)
VIX	-0.028**	(-2.55)	0.003	(0.21)	(+)
Interest expense	-0.136***	(-6.31)	-0.088***	(-3.21)	(+)
Short-term external debt	0.030**	(2.23)	0.040**	(2.49)	(+)
GDP per capita	1.631***	(2.62)	1.956***	(2.63)	
Corruption index	0.078***	(3.93)	0.041*	(1.68)	(+)
Default history	-3.052***	(-3.68)	-7.606***	(-4.53)	
Exchange rate regime	-0.211	(-0.38)	-1.111**	(-2.11)	
Pseudo R ²	0.4403		0.4554		
Groups (N)	56		47		
Observations	683		499		

Foreign and Local Currency Ratings Regressions: Multinomial logit, country fixed effects, including TIPS interactive variable

	Foreign currency		Local currency	
Inflation	-0.064***	(-4.22)	-0.146***	(-4.93)
Inflation × TIPS	0.061**	(2.13)	0.13***	(3.19)
FX reserves	0.07***	(6.02)	0.047***	(2.79)
Development LC market	2.832***	(5.86)	0.849	(1.47)
Bank holdings public debt	-0.022***	(-4.24)	-0.031***	(-4.05)
VIX	-0.027**	(-2.55)	0.005	(0.37)
Interest expense	-0.156***	(-6.31)	-0.135***	(-4.33)
Short-term external debt	0.031**	(2.23)	0.042***	(2.62)
GDP per capita	1.617***	(2.62)	2.191***	(2.89)
Corruption index	0.077***	(3.93)	0.04	(1.64)
Default history	-3.178***	(-3.68)	-7.998***	(-4.94)
Exchange rate regime	-0.141	(-0.38)	-1.009*	(-1.91)
Pseudo R ²	0.4415		0.4595	
Groups (N)	56		47	
Observations	683		499	

Foreign and Local Currency Ratings Regressions: OLS, country fixed effects

	Foreign currency		Local currency	
Inflation	-0.019***	(-3.22)	-0.040***	(-3.03)
FX reserves	0.045***	(6.52)	0.023**	(2.44)
Development LC market	1.452***	(5.01)	0.315	(0.92)
Bank holdings public debt	-0.011***	(-3.97)	-0.019***	(-5.35)
VIX	-0.010	(-1.36)	0.011	(1.39)
Interest expense	-0.075***	(-6.83)	-0.062***	(-4.13)
Short-term external debt	0.019**	(2.28)	0.021**	(2.16)
GDP per capita	1.232***	(3.57)	1.258***	(3.00)
Corruption index	0.048***	(4.35)	0.031**	(2.31)
Default history	-1.849***	(-4.00)	-4.119***	(-5.72)
Exchange rate regime	-0.091	(-0.27)	-0.474	(-1.43)
Adj-R ²	0.895		0.890	
Groups (N)	56		47	
Observations	683		499	

Ratings Gap Regressions

Trinomial logit, country fixed effects

	Gap	
Inflation	0.055	(0.64)
FX reserves	-0.164***	(-2.93)
Development LC market	-2.838*	(-1.91)
Bank holdings public debt	-0.080***	(-3.89)
VIX	0.140***	(4.33)
Interest expense	0.521***	(4.16)
Short-term external debt	-0.154**	(-2.06)
GDP per capita	1.392	(0.79)
Corruption index	-0.104**	(-1.97)
Default rate	-3.968	(-0.00)
Exchange rate regime	0.124	(0.09)
Pseudo R ²	0.6107	
Groups (N)	47	
Observations	499	

Ratings Gap Regressions

OLS, country fixed effects

	Gap	
Inflation	-0.012*	(-1.67)
FX reserves	-0.018***	(-3.49)
Development LC market	-0.654***	(-3.44)
Bank holdings public debt	-0.011***	(-5.66)
VIX	0.022***	(4.77)
Interest expense	0.014*	(1.73)
Short-term external debt	-0.006	(-1.03)
GDP per capita	0.295	(1.27)
Corruption index	-0.031***	(-4.04)
Default rate	-0.781*	(-1.95)
Exchange rate regime	-0.162*	(-0.88)
Pseudo R ²	0.549	
Groups (N)	47	
Observations	499	

What factors might explain the decline in gap over the past two decades?

- Preliminary exercise:
 - Take three year rolling average of explanatory variables
 - Subtract the first from last observation (2015 value - 1997 value)
 - Multiply by the coefficients in the ratings gap regressions
- Results:
 - Increase in **FX reserves** corresponds to 0.4 notch decline in the gap
 - **Development of local currency markets** 0.3 notch decline
 - **Decline in VIX** 0.1 notch decline

Summing up

- Steady and broad based decrease in the gap over the past two decades
- Coefficients of drivers of FC and LC risk mostly in line with hypothesis
 - FC risk reduced disproportionately by more FX reserves, development local currency markets, less global volatility
 - LC risk increased disproportionately by greater bank exposure to public debt
 - Simple inflation hypothesis does not hold: No indication of substituting monetisation for default risks when inflation is high
- What might explain the decreased gap over time?
 - Higher FX reserves the most likely candidate, to a lesser degree local currency market development and lower global volatility

Going forward: might gap widen again?

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Appendix I: Emerging economies (73)

Emerging Asia (13)	Bangladesh, China, Chinese Taipei, Fiji, India, Indonesia, Korea, Malaysia, Pakistan, Philippines, Sri Lanka, Thailand, Vietnam	R,
Latin America (20)	Argentina, Bahamas, Barbados, Belize, Bolivia, Brazil, Chile, Colombia, Costa Rica, Dominican Republic, Ecuador, Guatemala, Jamaica, Mexico, Panama, Paraguay, Peru, Trinidad and Tobago, Uruguay, Venezuela	
Emerging Europe (22)	Albania, Belarus, Bosnia & Herzegovina, Bulgaria, Croatia, Czech Republic, Estonia, Hungary, Georgia, Kazakhstan, Latvia, Lithuania, Macedonia, Montenegro, Poland, Romania, Russia, Serbia, Slovakia, Slovenia, Turkey, Ukraine	
Middle East and N. Africa (9)	Bahrain, Egypt, Jordan, Kuwait, Lebanon, Morocco, Oman, Qatar, Saudi Arabia	
Sub-Saharan Africa (9)	Botswana, Democratic Republic of Congo, Gabon, Ghana, Kenya, Nigeria, Senegal, South Africa, Uganda	

Appendix III: Control variables

PD	General government gross debt (As a percentage of GDP)
IR	General government expense, interest (As a percentage of general government revenue)
STD	Consolidated cross-border claims of all BIS reporting banks on countries outside the reporting area with a maturity of up to one year plus international debt securities outstanding with a remaining maturity of up to one year (As a percentage of GDP)
dlog(YD)	Gross domestic product per capita, constant prices, changes in logarithm
TI	Corruption perception index (0-100) from Transparency International, which scores and ranks countries/territories based on how corrupt a country's public sector is perceived to be. It is a composite index, a combination of surveys and assessments of corruption, collected by a variety of reputable institutions.
DR	1/number of years since latest default
D4	Exchange rate regime: free floating = 1; otherwise = 0

Appendix II: Variable related to main hypotheses

YCPI	Inflation, average consumer prices (In per cent)
FX	International reserves excl gold (As a percentage of GDP)
OSIN_NARROW	Max (1 – (securities in currency i / securities issued by country i), 0)
OSIN_BROAD	Max (securities and loans issued by country i in five major currencies / all securities and loans issued by country i , OSIN_NARROW)
BANK	Domestic banks' holdings of public debt using financial institutions' net claims to the government relative to their total assets, following Gennaioli et al (2014) and Kumhof and Tanner (2008): Sum of net claims minus liabilities on (central govt, local govt and public non-financial) / sum of net claims minus liabilities on (public and private sector (excluding claims on depository corporations by other financial corporations) by i) other depository corporations (excluding central banks) and ii) other financial corporations
VIX	Chicago Board Options Exchange S&P 500 implied volatility index; standard deviation (In percentage points per annum)