The Russian Sovereign Bonds Yield Curves Arbitrage: Relative Value in the Eurobonds and the Ruble Bonds

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Motivation

I. Risky sovereign multicurrency yield curves based on Eurobonds and local currency (LC) treasuries pose significant conceptual challenges but also provide good investment opportunities

- EM local bonds are an important asset class and unravelling the complexity of it could give an edge to investors for a better understanding of their risk and return characteristics
- Interplay of arbitrage, financial, and macro forces; political as well
- Global banks (GS, JPM, DB,...) have special research reports on LC bond markets; Global Asset Managers too
- IMF, WB, EBRD, and OECD jointly started from 2011 to have a special agenda on developing the LC bond markets (Title of the report: LCBM - a diagnostic framework)
- Central Banks, Fiscal Authorities, Local banks, Global banks, and Hedge funds (global macro, EM, fixed income arbitrage based) are significant players

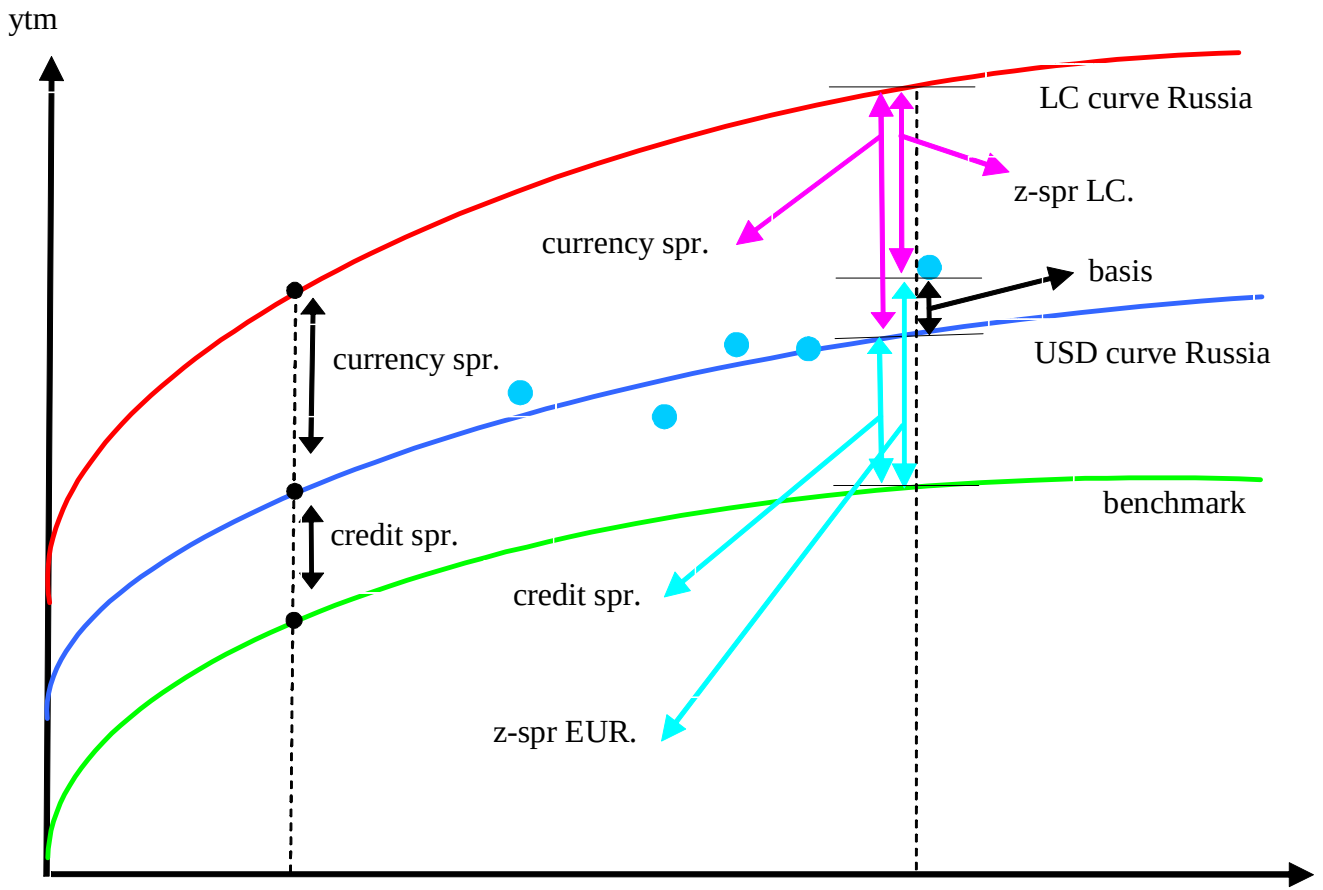
Motivation

II. The Russian Bond market - a perfect example for a LCBM

- Relative liquidity in Eurobonds, CDS, and the Ruble bonds
- The Russian Federation - a large economy with independent CB's monetary policy
- Abundance of local banks in CIS
- The Ruble develops as a global currency
- Large spillovers form the LCBM to the corporate bond market

Problem setting

I. Yield curves snapshot



Problem setting

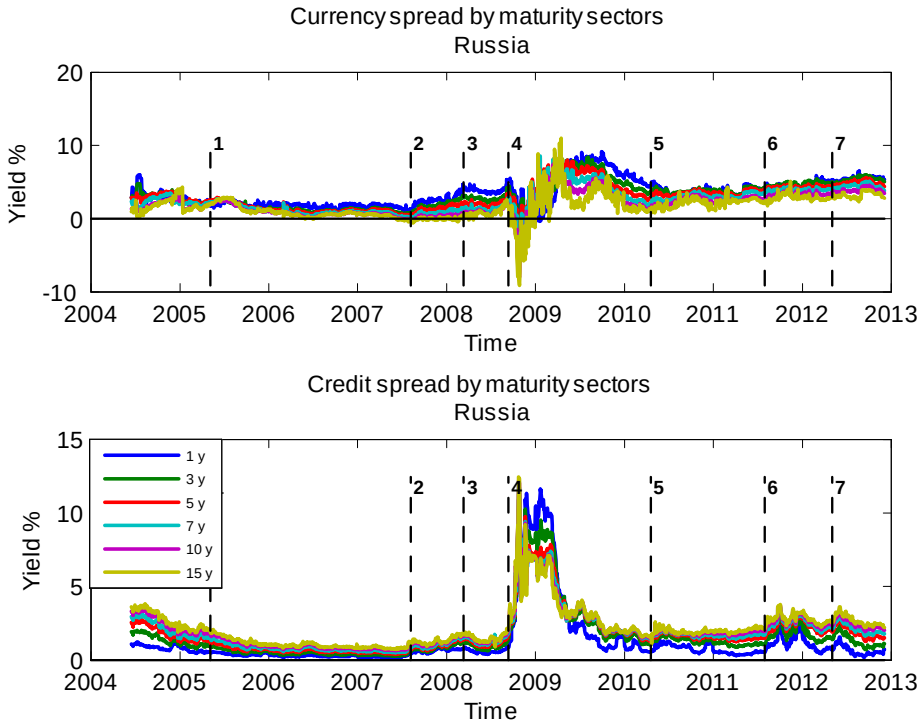
II. The good understanding of sovereign risk requires a complex approach and a thorough multi-faceted diagnostics

- structural financial
  The foreign debt and the domestic debt the sovereign issues, together with its monetary base, could be considered contingent claims (tranches) on the country's assets. So they share a common underlying and are mutually interdependent. This is a CDO based portfolio balance approach.
- no-arbitrage financial
  A stochastic no-arbitrage reduced form interest rate model, suitably adjusted to the concrete situation, could upgrade the structural setting. The bonds can be viewed as contingent claims on general factors (shifts, slopes, etc.). It could be of value to understand some types of market inefficiencies: CDS-Bonds basis, counterparty risk arbitrage, funding arbitrage, etc.
- macro-financial
  The yield curve is a macro aggregate related to other macro aggregates. An open economy macro view is needed.

Empirics

I. Risky spreads

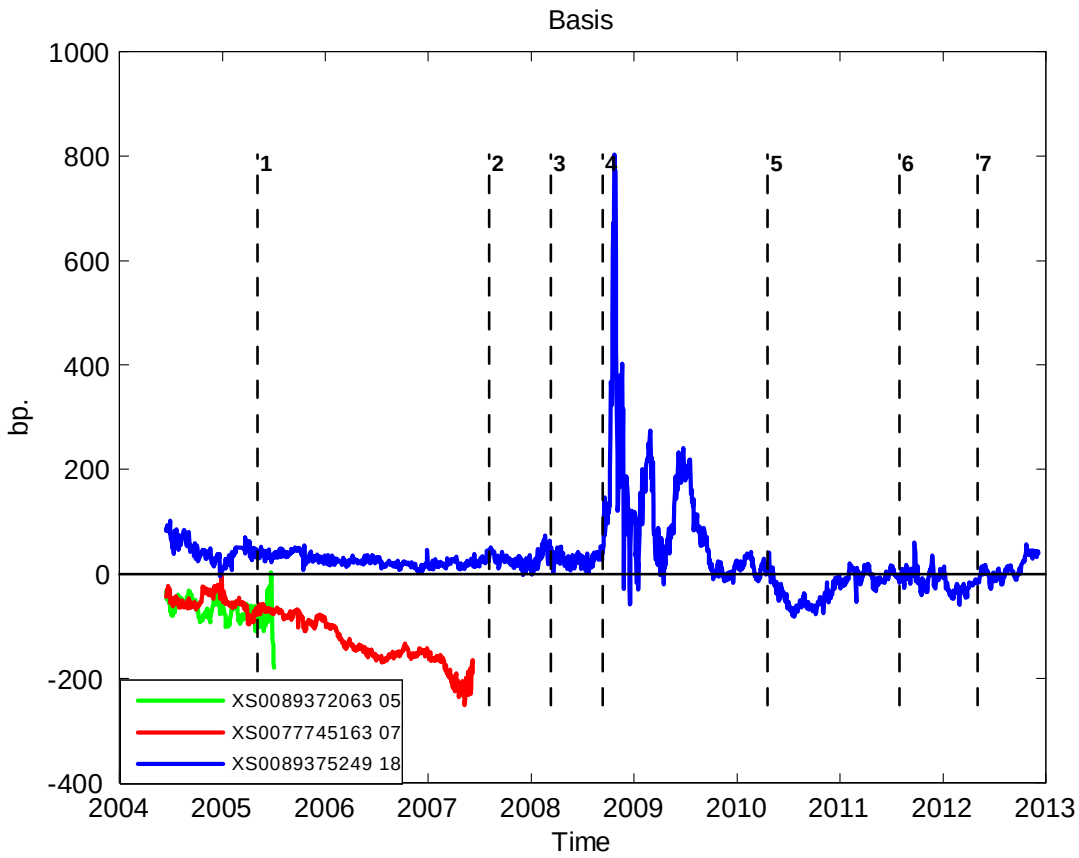
- Both the credit spread and the currency spread share a non-trivial evolution



1. GM turmoil May 09, 2005, 2 - Liquidity crisis August 09, 2007, 3 - Bear Sterns default March 14, 2008, 4 - Lehman default September 15, 2008, 5 - Greek turmoil April 23, 2010, 6 - US rating downgrade August 5, 2011. 7 - ECB woes, 06 May, 2012

II. CDS-Bond Basis

- The CDS-Bonds basis seems to be and it is a nontrivial thing to deal with



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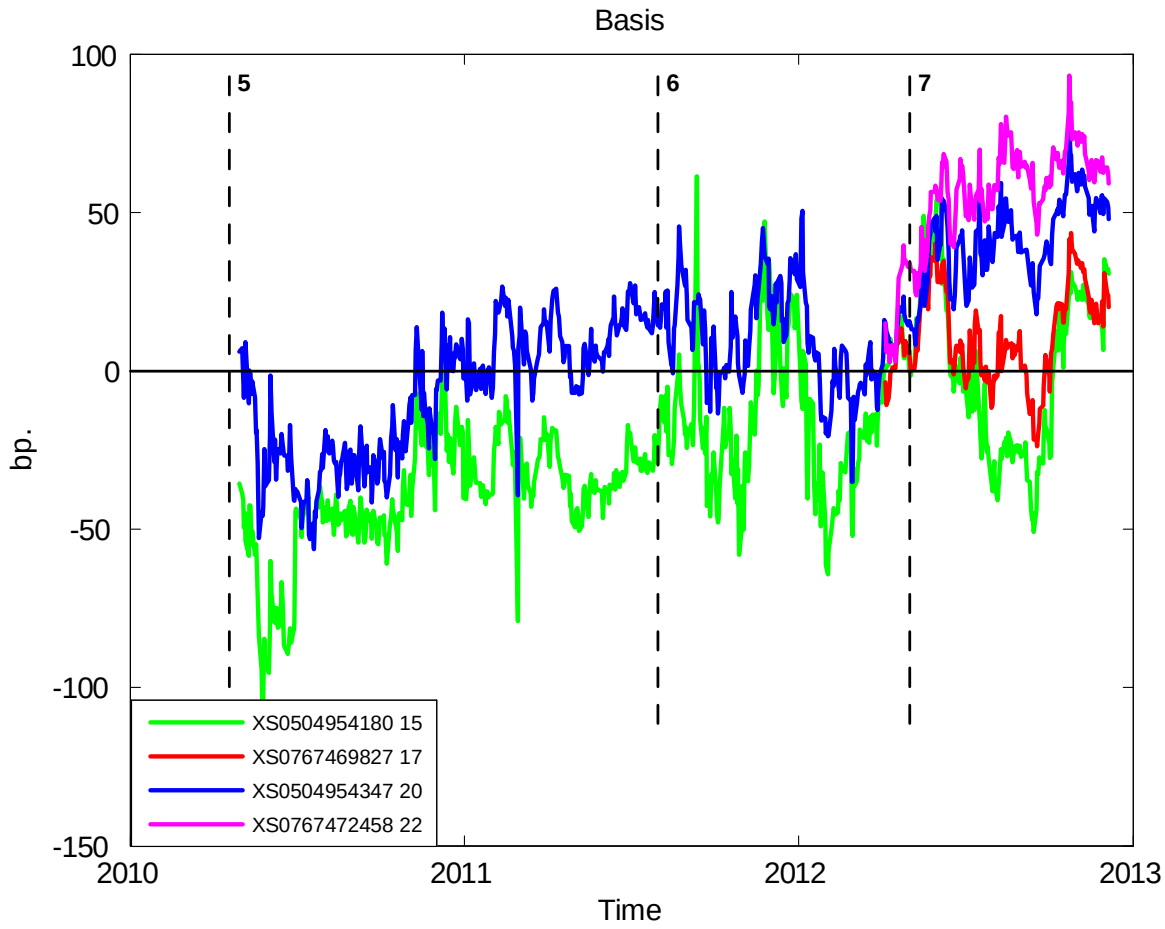


Structural view setting

I. Bonds as contingent claims (tranches) on the sovereign assets

- Balance sheet of the sovereign = Fiscal Authority (Min. Fin.) + Central Bank balance sheets

Assets: $A_{d,EUR}$	Liabilities: $TCL_{d,EUR}$
1) FX reserves	1) Foreign debt: $P^*_{f,USD}$
2) Net fiscal assets	2) Domestic debt: $P^*_{d,USD}$
3) Other public assets	3) Monetary base: $M_{d,USD}$

- The foreign debt, the domestics debt, and the monetary base have seniority ranking payoffs:

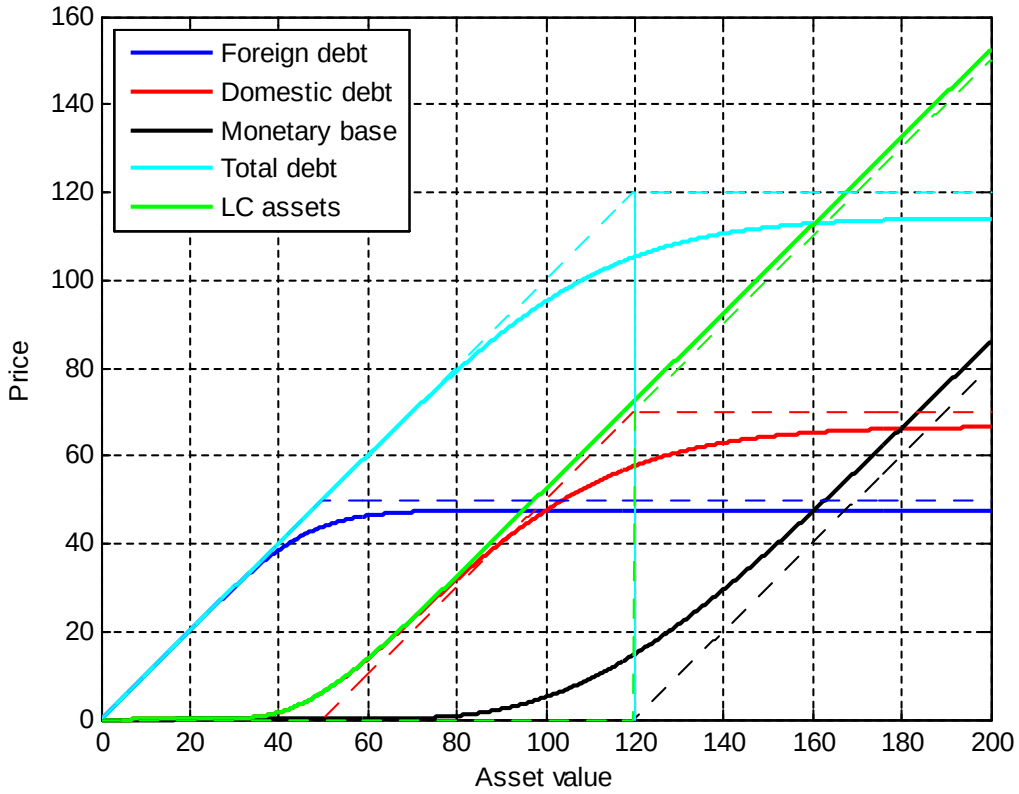
Foreign debt: $P^*_{f,USD}(T,T)=A_{d,USD}(T)-\max(A_{d,USD}(T)-B_{f,USD},0)$

Domestic debt: $P^*_{d,USD}(T,T)=\max(A_{d,USD}(T)-B_{f,USD},0)-\max(A_{d,USD}(T)-B_{f,USD}-B_{d,LC}X(T-),0)$

Monetary base: $M_{d,USD}(T,T)=\max(A_{d,USD}(T)-B_{f,USD}-B_{d,LC}X(T-),0)$

Structural view setting

- Graphical representation



Note: The monetary base is a residual claim (junior tranche). Then comes the domestic debt (mezzanine tranche). Finally, we have the foreign debt (supersenior tranche).

Structural view setting

II. Model setup

- Dynamics
  $\frac{dX(t)}{X(t-)} = (r_{USD}(t) - r_{LC}(t))\,dt + \sigma_X d\widetilde{W}^{Q^f}(t)$
  $\frac{d\ A_{d,USD}(t)}{A_{d,USD}(t-)} = r_{USD}(t)dt + \sigma_{A_{d,USD}} dW^{Q^f}(t)$
  with $d[W^{Q^f}(t), \widetilde{W}^{Q^f}(t)]=\rho dt$; Q^f-foreign martingale measure
- Macro view
  The initial variables B_d, B_f, $A_{d,LC}(t)$, and $X(t)$ are constrained depending on our macro view (boom, recession, balance of payments/budget deficit adjustment, etc.). Special attention on sterilization and open market operations. Keynesian and New-Classical views can easily be incorporated.

Structural view benefit

I. Model calibration and implementation

- Implementation
  1) Calibrate to two tranches - e.g. the domestic debt and the monetary base; 2) Get the fair value of the implied assets vol. and the implied assets magnitude; 3) Put your favorite macro view and adjust the implied output if necessary; 4) Get the fair value of the foreign debt
- Diagnostic checking
  With statistical tools see if the fair values are close to the market ones. Yes, they are (experience on 25 EMs). A good relative value tool.

II. Trading strategies

- A plenty of trading strategies are possible, e.g.: 1) relative value (foreign debt vs. domestic debt); 2) correlation trading (assets vol.=CDO base correlation); 3) macro views (betting on the implied assets deviation from the potential and macro adjustment, in general, betting on the consistency among B_d, B_f, $A_{d,LC}(t)$, and $X(t)$.

No-arbitrage view setting

I. Heath, Jarrow, Morton setting

- Model the stochastic evolution of the forward rates of the riskless benchmark, the foreign debt, and the domestic debt as well as the exchange rate. Allow for a jump in the interest rates and the exchange rate at the time of default.

$$
\begin{aligned}
df_{USD}(t,T) &= \alpha_{USD}(t,T)dt + \sigma_{USD}(t,T)dW^P(t) \\
df^*_{USD}(t,T) &= \alpha^*_{USD}(t,T)dt + \sigma^*_{USD}(t,T)dW^P(t) + \int_E \delta^*_{EUR}\mu \\
df^*_{LC}(t,T) &= \alpha^*_{LC}(t,T)dt + \sigma^*_{LC}(t,T)dW^P(t) + \int_E \delta^*_{LC}\mu \\
dX(t)/X(t-) &= \alpha_X(t)dt + \sigma_X(t)dW^P(t) - \int_E \delta_X\mu
\end{aligned}
$$

f_{USD}-benchmark, f^*_{USD}-foreign debt, f^*_{LC}-domestic debt,
$X(t)$-exchange rate, μ-jump measure, δ-jumps, $P-$real world measure

No-arbitrage view setting

II. No-arbitrage condition

- Gives a general conceptual understanding of the risk drivers in the multi-curve framework

$$\begin{aligned} \text{(credit spread):} \quad & r^*_{USD}(t) - r_{USD}(t) = h(t)\varphi(t)\phi(t)R_1(t) \\ \text{(currency spread):} \quad & r^*_{LC}(t) - r^*_{USD}(t) = -\alpha_X(t) - \phi(t)\sigma_X(t) \\ & + h(t)\phi(t)\varphi(t)R_2(t) \end{aligned}$$

$h(t)$-intensity of default; $\phi(t)$-market price of diffusion risk; $\varphi(t)$-market price of jump (crash) risk; $R(t)$-recovery corrections

No-arbitrage view setting

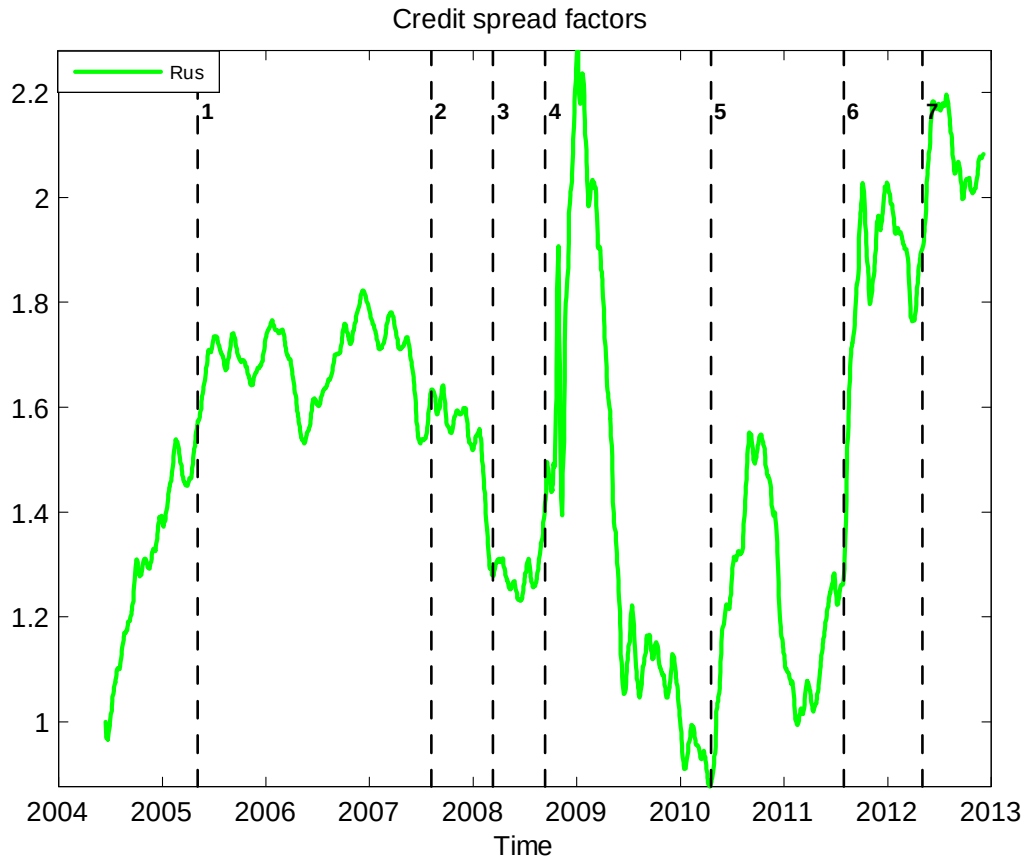
III. Model calibration and implementation

- Curve building
  Two possibilities: 1) Build separately the foreign debt curve using CDS quotes and the local debt curve using Ruble treasuries. Careful on the recovery assumptions. Should be the same for the two curves. Foreign debt curve - recovery of par, Ruble curve - recovery of market value or recovery of par. A special procedure is needed from the CDS premia to get curves under the two recovery assumptions. Extract the risky spreads. 2) Build jointly the two curves so that achieve smooth risky spreads.
- Affine framework
  In an affine framework, calibrate the model to the benchmark curve, the credit spread, and the currency spread.
- Factors
  Get the implied factors that drive the spreads.

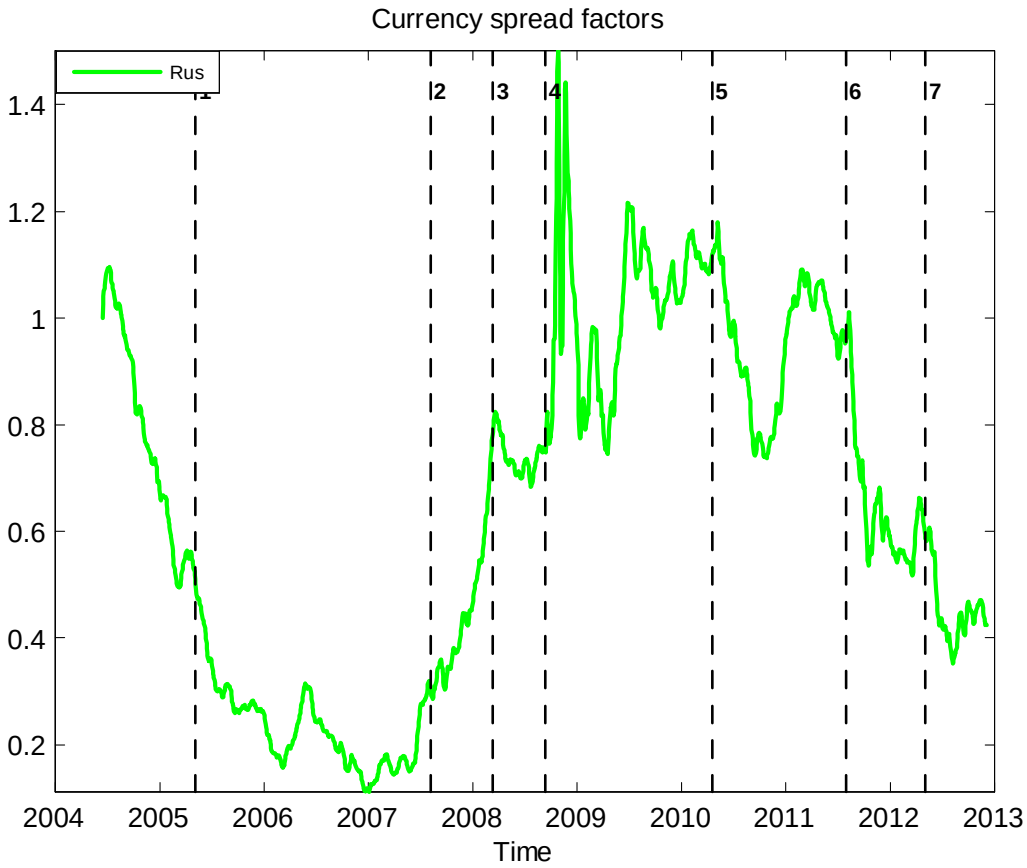
No-arbitrage view setting

IV. Empirics

- Factors extraction
  By extended Kalman filter we can get the factors driving the credit spread and the currency spread and give them a geometric interpretation (shift, slope, etc.)



No-arbitrage view setting



No-arbitrage view benefit

I. Relative value
   - Statistical prediction of the extracted factors (technical rules, cointegration, general intuition, etc.)
   - Relate the factors to general macro-financial variables

II. CDS-Bonds basis
   - New methodology needed for measuring the basis on two curves (Z-spread, par equivalent spread, etc.)
   - Formulation of advanced trading strategies is possible for arbitraging the basis on two curves

Conclusion

- Multicurve sovereign bonds provide challenges and opportunities
- A large set of relative value strategies is possible
- Advanced quant techniques are indispensable
- Joint project with CBonds targeting the Russian market[1]
  (i) A series of papers (technical notes) to be published in the CBonds Review Journal as well as on the Cbonds web page. Only basic ideas will be exposed.
  (ii) A further elaboration and software (spreadsheets) development[2] on institutions' (research, treasury, etc. departments) special request and cooperation.

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Thank you for your attention!
Q&A