Is Russia Stock a Good Hedge for Ruble?

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1. Background and Problem Formulation

   In this notebook, I hope to show how an empirical risk manager would work through a problem. The goal is to figure out if the Russian stock could provide hedging for holding the Ruble, given a scenario that investors could liquidate their long positions in stock then get the Ruble back, but cannot liquidate the Ruble to get USD back.

   The first stage will be focused on understanding the correlation among various stock indices and the RUBUSD spot, as well as the time-varying beta of stock against RUBUSD. A negative corr is what we desired, but any corr which is less than 1 will give us some actual diversification benefit if we allocate among stock and FX.

   The second stage is to come up with an optimal asset allocation (in terms of a specified objective function, like CVaR, TailRatio) given the RUBUSD and a set of the pre-war MSCI index universe (similar to the current locked portfolio holdings).

   Assuming there is no more inflow to Russian stocks, the change of NAV towards RU stock will be in [-1, 0] and the one towards RUBUSD will be in [0, 1]. Some metrics to evaluate the holding weight and allocation performance will be helpful.

   Finally and as a bonus, if time allows, I will do some comparative analysis between the LO and LS portfolios given the potential existence of a long-only constraint, in terms of the active NAV change of RUBUSD due to the FX market limit (new port benched against the locked port). There are several impact factors under consideration: (1) market dispersion / underlying corr, (2) (active) risk budget, and (3) size of the underlying universe. Resulted metrics may include (1) transfer coef. (2) security-level risk concentration level, (3) proportion of incidental (active) risk taking on styles.

2. Data Fetching and Processing

   All data are from Bloomberg. Without further clarification, all price levels are denominated in USD.

   Pre-war: Jun 2017 - Feb 2022:

   Overall Russian stock indices: MXRU, MXRUIM

   Style indices: Growth - MGUERUS, Value - MVUERUS

   Large/Mid/Small cap indices: MXRULC, MXRUMC, MXRUSC

   Sector indices: consumer staples - MXRUOCS, materials - MXRUOMT, energy - MXRUOEN, communication service - MXRUOTC, utilities - MXRUOUT, financials - MXRUOFN

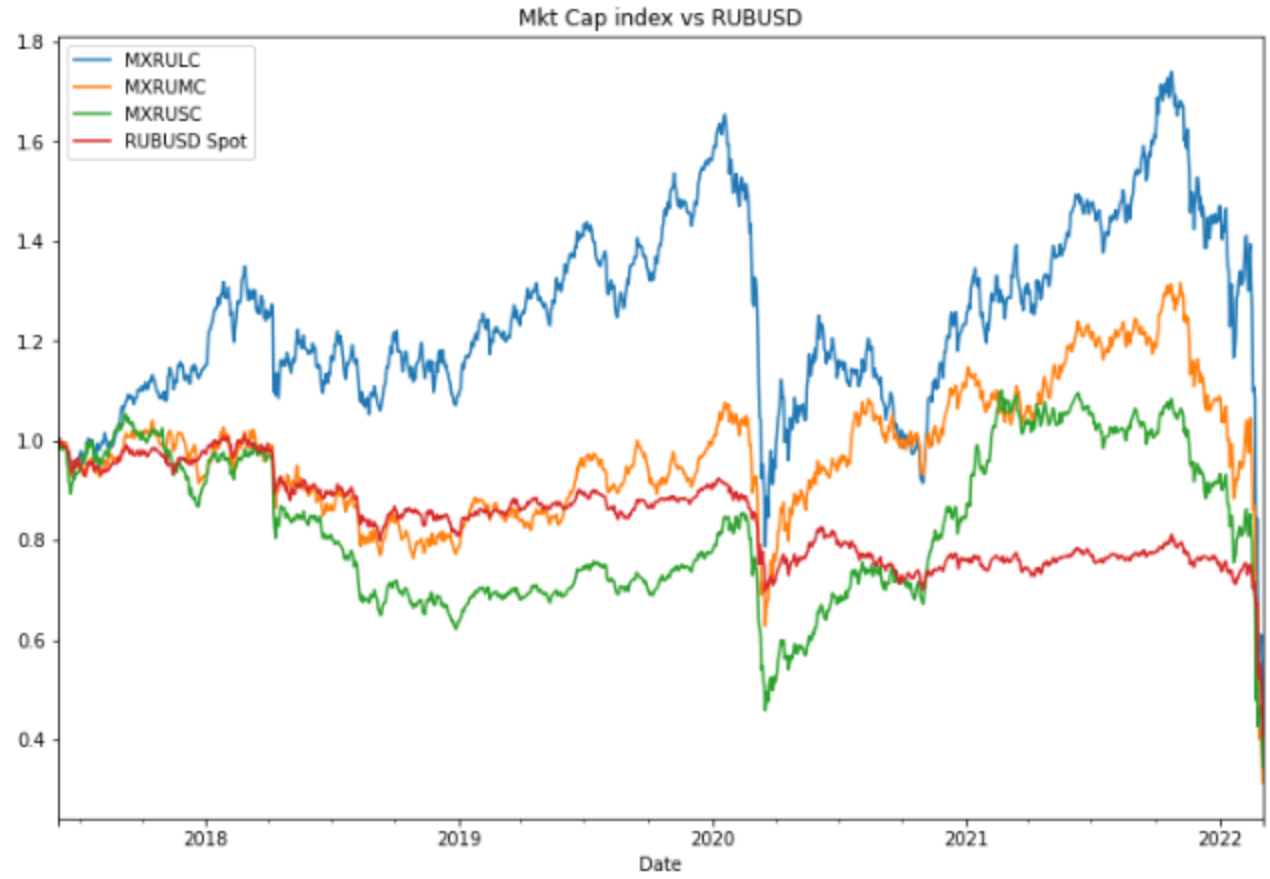
   Post-war: Mar 2022 - May 2022

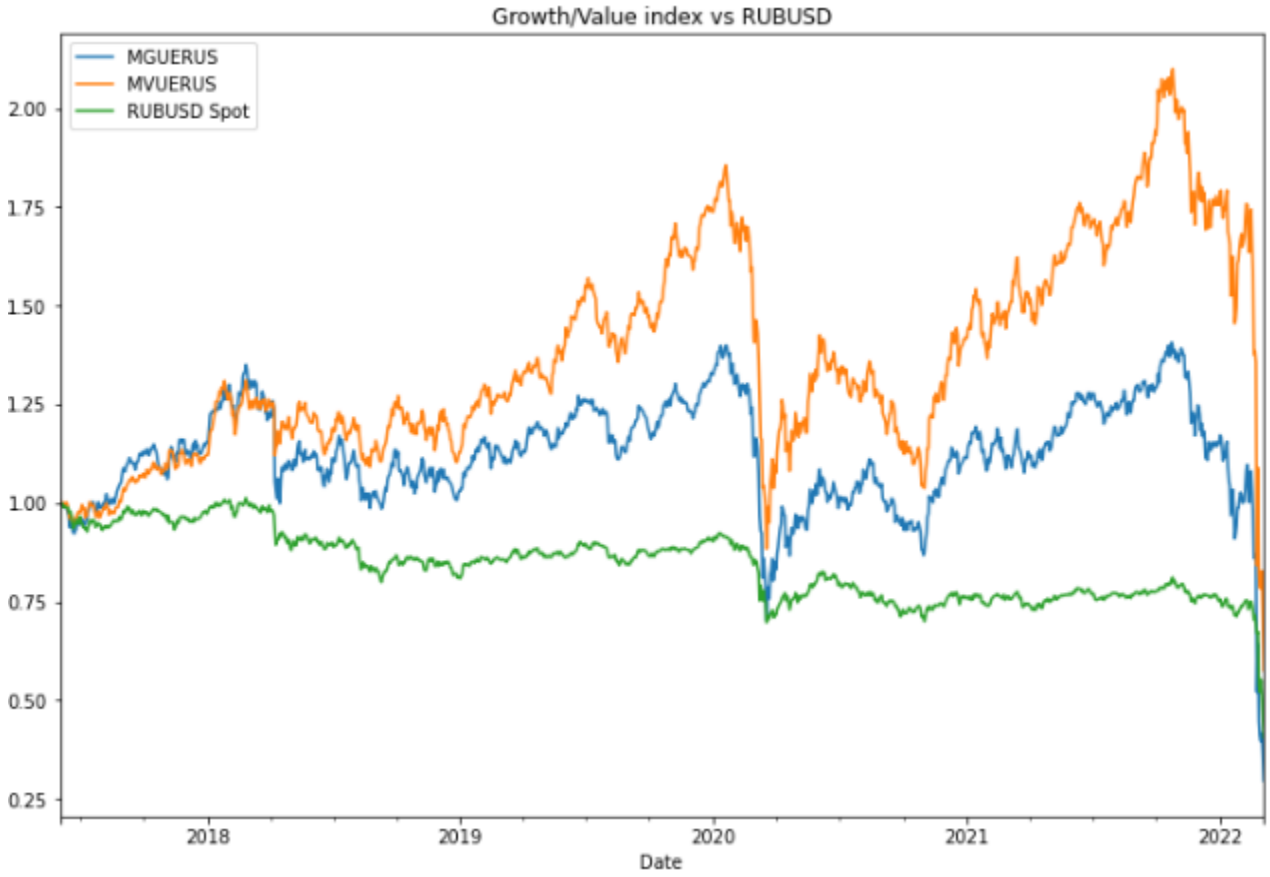
The constituents of an overall Russian stock index (MXRUIM), including daily price series and market cap as weights (in RUB). Still in the process of calculating the index-level data.

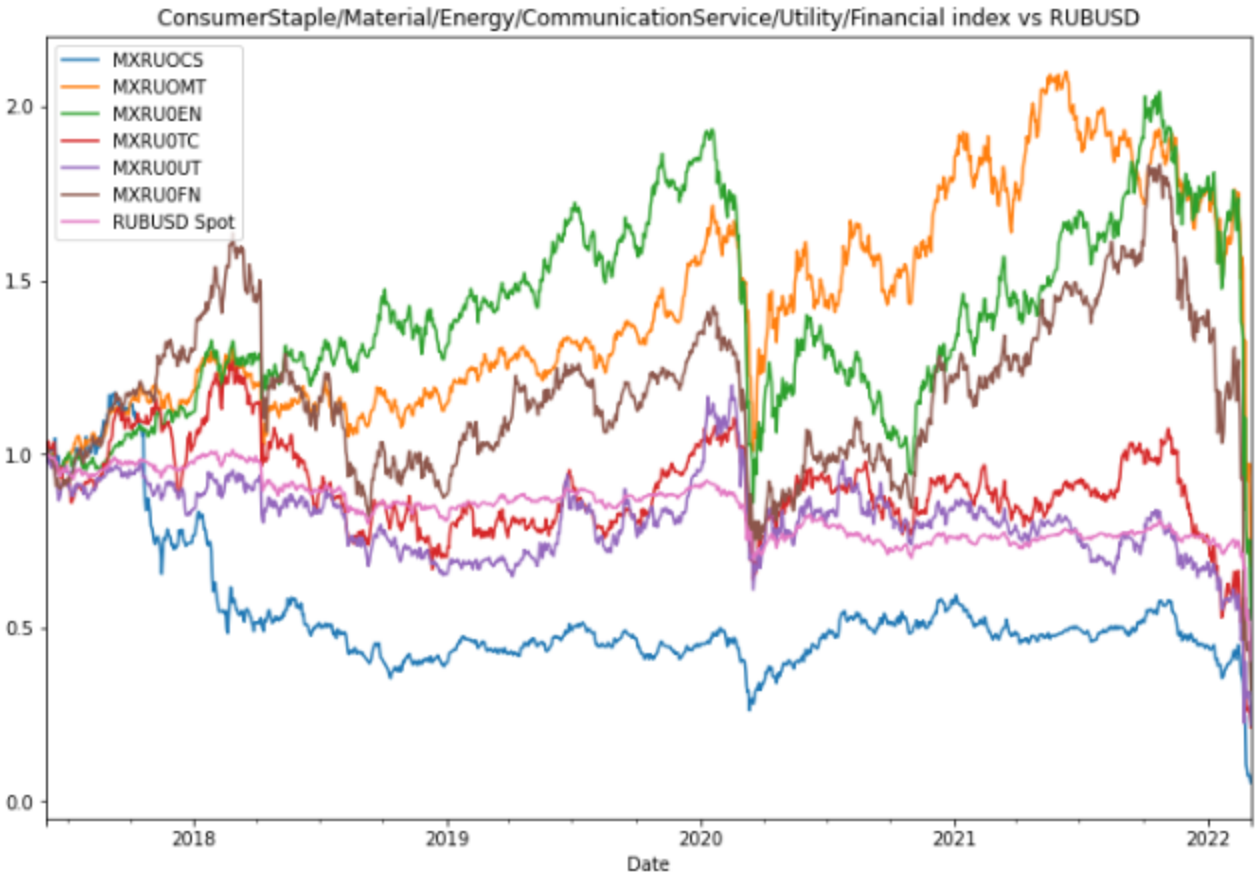
3. Understanding the Data

- MSCI IMI index is mainly driven by large-cap names.
- Value starts outperforming Growth in mid-2018.
- Rank of corr with RUBUSD: Overall (~0.92) > Growth/Value (~0.91) > Financial/Energy (~0.87) > MidCap/SmalCap/Material/TeleComm (~0.78) > Utility (~0.68) > ConsumerStaple (~0.52).
- As an EM market, a large positive corr with its domestic currency shows the stock price could be reflected by the flow in/out of the FX market.

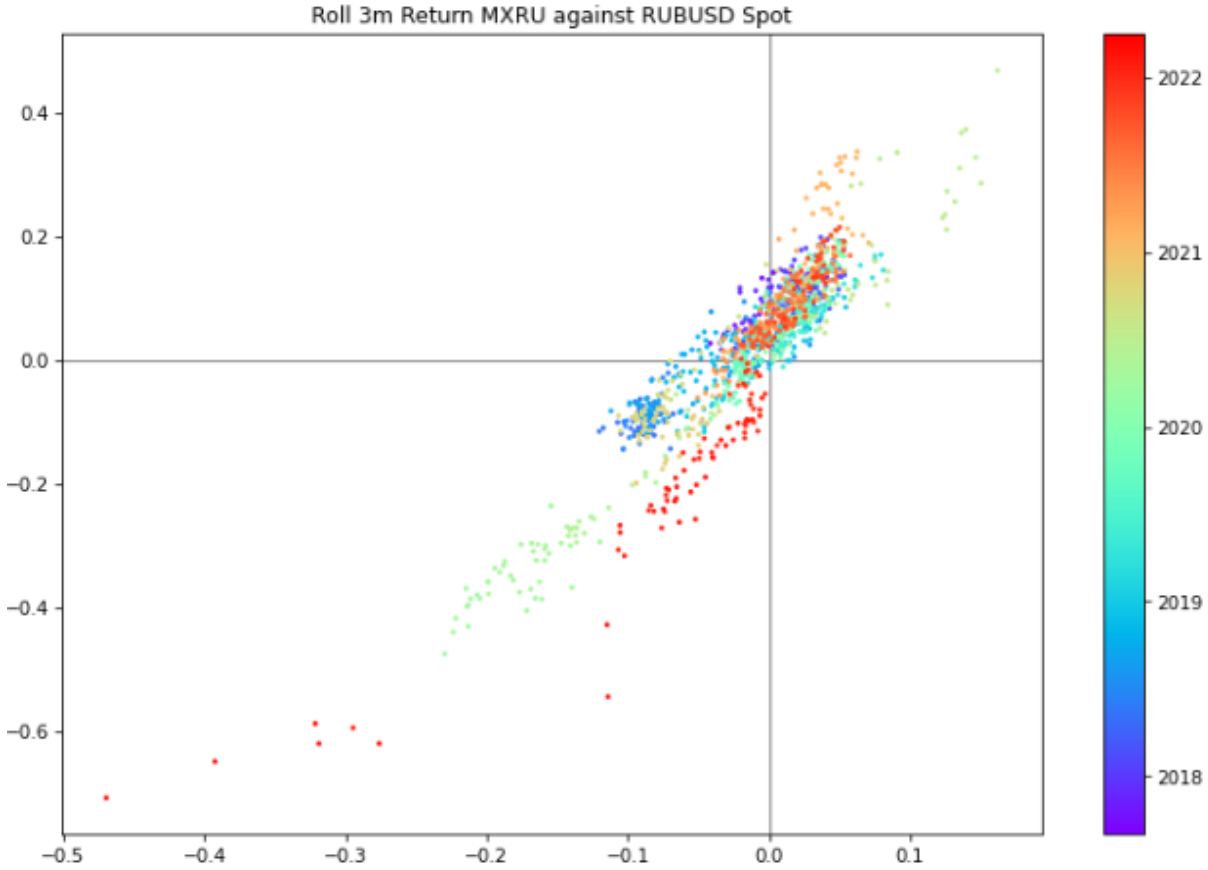
Below is the cumulative return plot if normalizing the initial value to be 1.

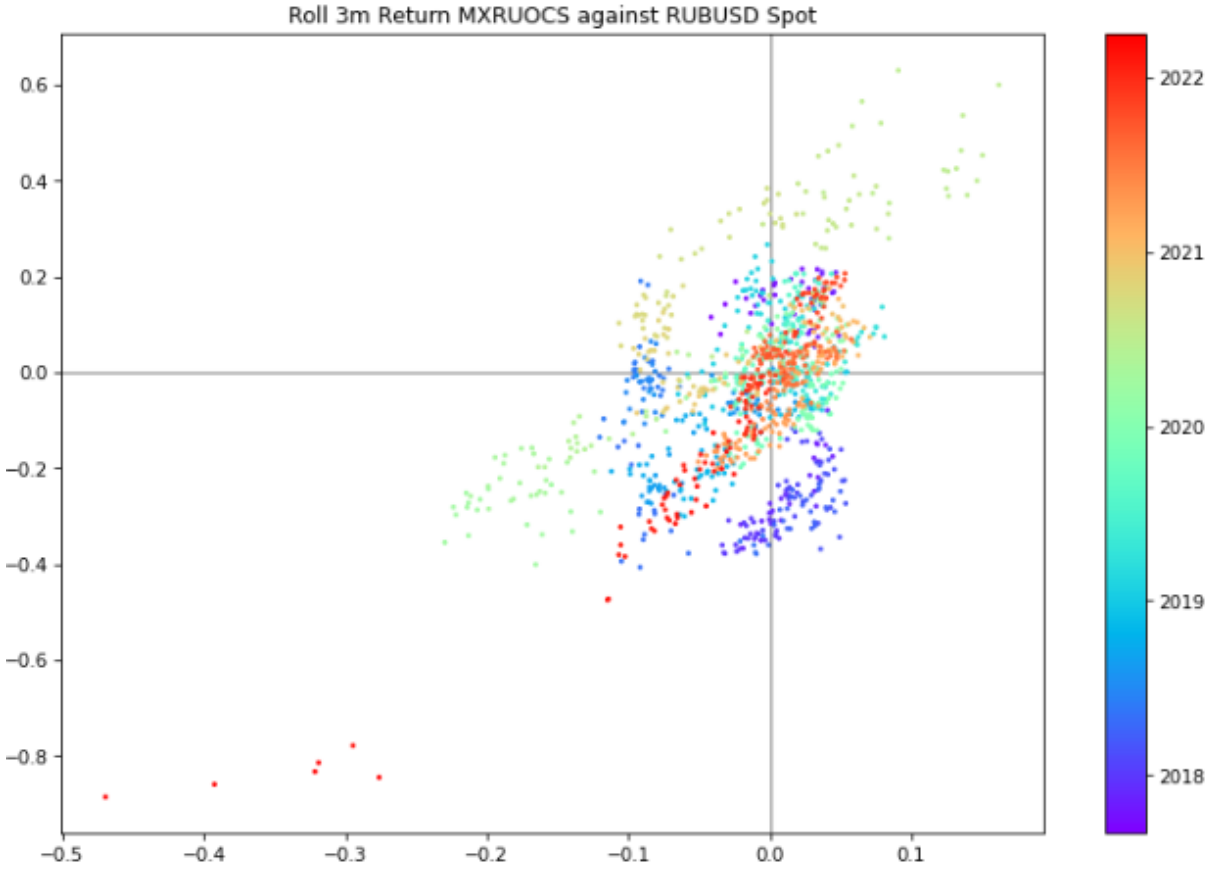

Mkt Cap index vs RUBUSD
MXRULC
MXRUMC
MXRUSC
RUBUSD Spot
1.8
1.6
1.4
1.2
1.0
0.8
0.6
0.4
2018
2019
2020
2021
2022
Date


Growth/Value index vs RUBUSD
MGUERUS
MVUERUS
RUBUSD Spot
2.00
1.75
1.50
1.25
1.00
0.75
0.50
0.25
2018
2019
2020
2021
2022
Date

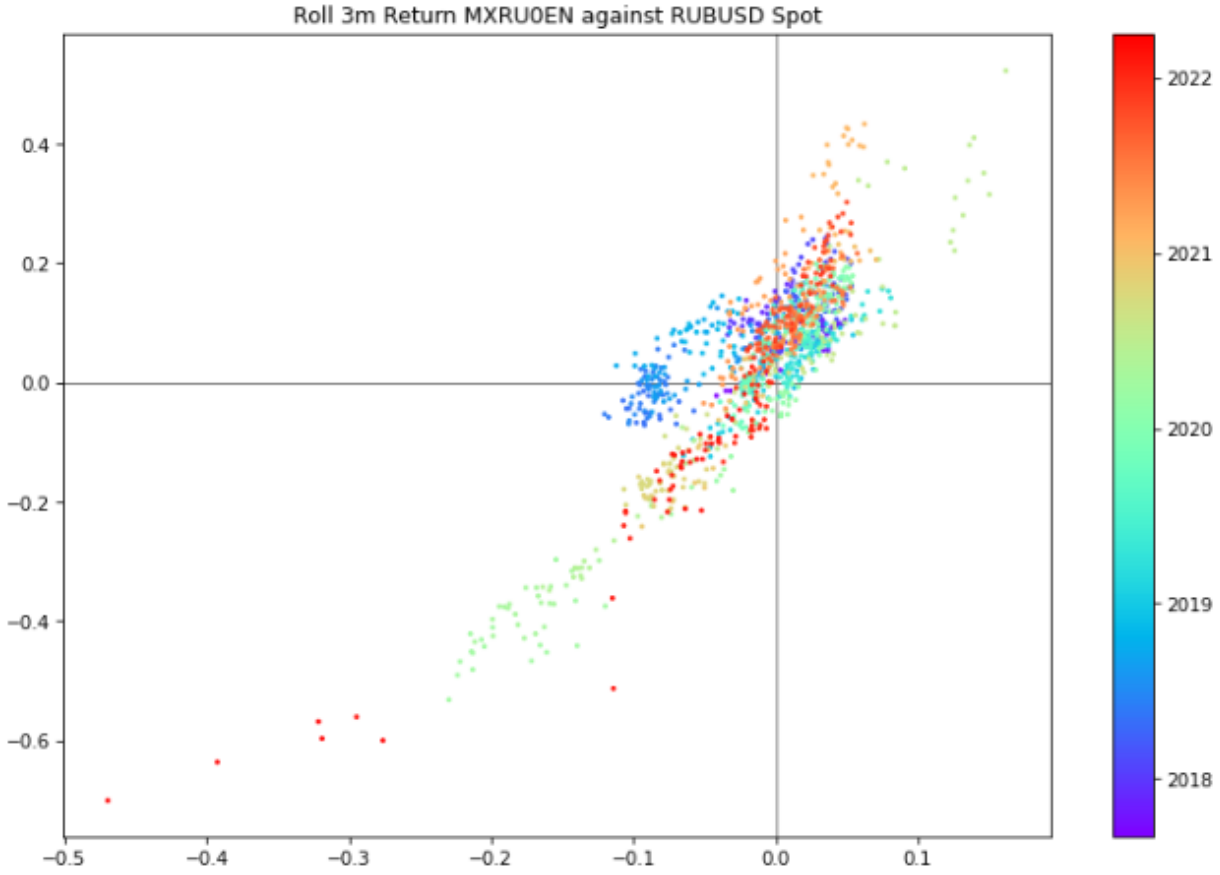


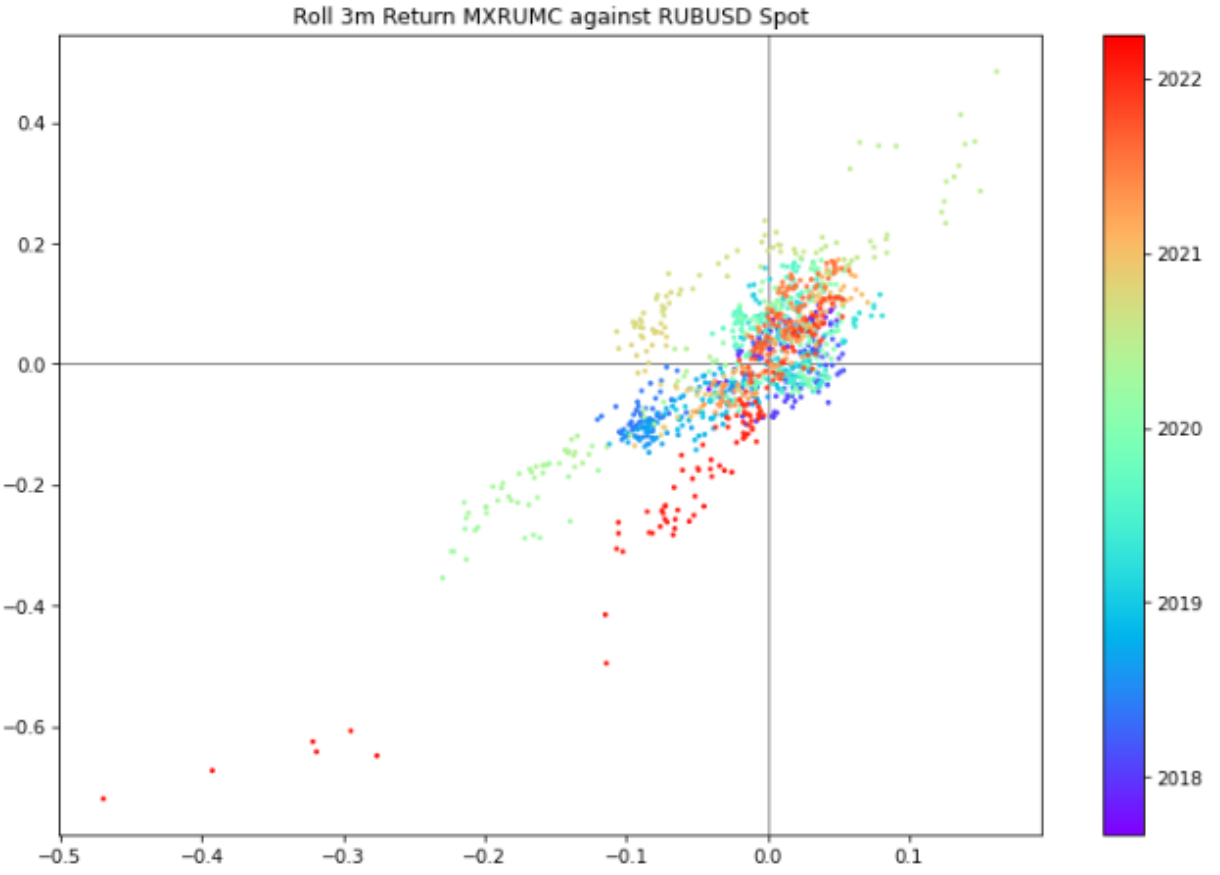
Below is the rolling 3-month window corr plot against RUBUSD, with colorbar showing the time progression.




Roll 3m Return MXRUOCS against RUBUSD Spot
0.6
0.4
0.2
0.0
−0.2
−0.4
−0.6
−0.8
−0.5
−0.4
−0.3
−0.2
−0.1
0.0
0.1
2022
2021
2020
2019
2018


Roll 3m Return MGUERUS against RUBUSD Spot
0.4
0.2
0.0
−0.2
−0.4
−0.6
−0.8
−0.5
−0.4
−0.3
−0.2
−0.1
0.0
0.1
2022
2021
2020
2019
2018


Roll 3m Return MXRU0EN against RUBUSD Spot
0.4
0.2
0.0
−0.2
−0.4
−0.6
−0.5
−0.4
−0.3
−0.2
−0.1
0.0
0.1
2022
2021
2020
2019
2018


Roll 3m Return MXRUMC against RUBUSD Spot
0.4
0.2
0.0
−0.2
−0.4
−0.6
−0.5
−0.4
−0.3
−0.2
−0.1
0.0
0.1
2022
2021
2020
2019
2018

4. Time-varying Beta/Corr Estimate for Excess Returns

We take the 3-month US Treasury yield as the risk-free rate for a USD-based investor, then calculate the excess returns for both stock indices and FX.

To provide the PE and RM with a more granular understanding of the dynamics of Beta (stock indices against RUBUSD) as well as the Corr calculated from Beta, I implemented a Kalman-Filter-based regression framework to estimate the Beta in an iterative fashion. Long story short, our Beta will be time-varying, which could reflect the most up-to-date market information, instead of being constant through the entire estimation period.

Overall mkt index vs RUBUSD

- mid 2017 - pre-covid:
  corr around 0.5, beta around 0.8 - 1.2, insignificant upward trend for both corr and beta

- Covid break and recover:
  a downward jump for both corr and beta during the initial break, then jump back to a higher level than pre-covid

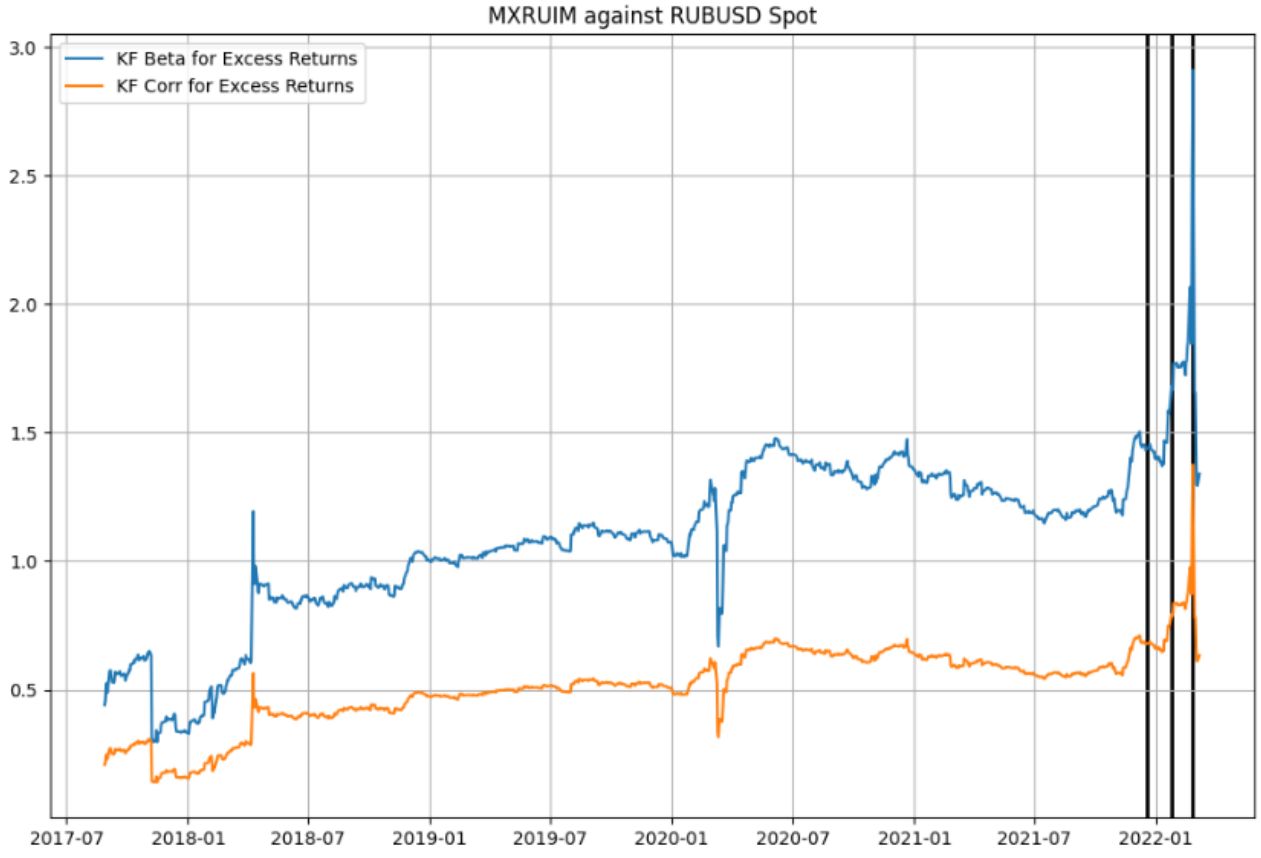
- post-covid - late 2021:
  corr driving around 0.6 - 0.7, beta within 1.2 - 1.5, slight but significant downward trend during mid 2020 to mid 2021

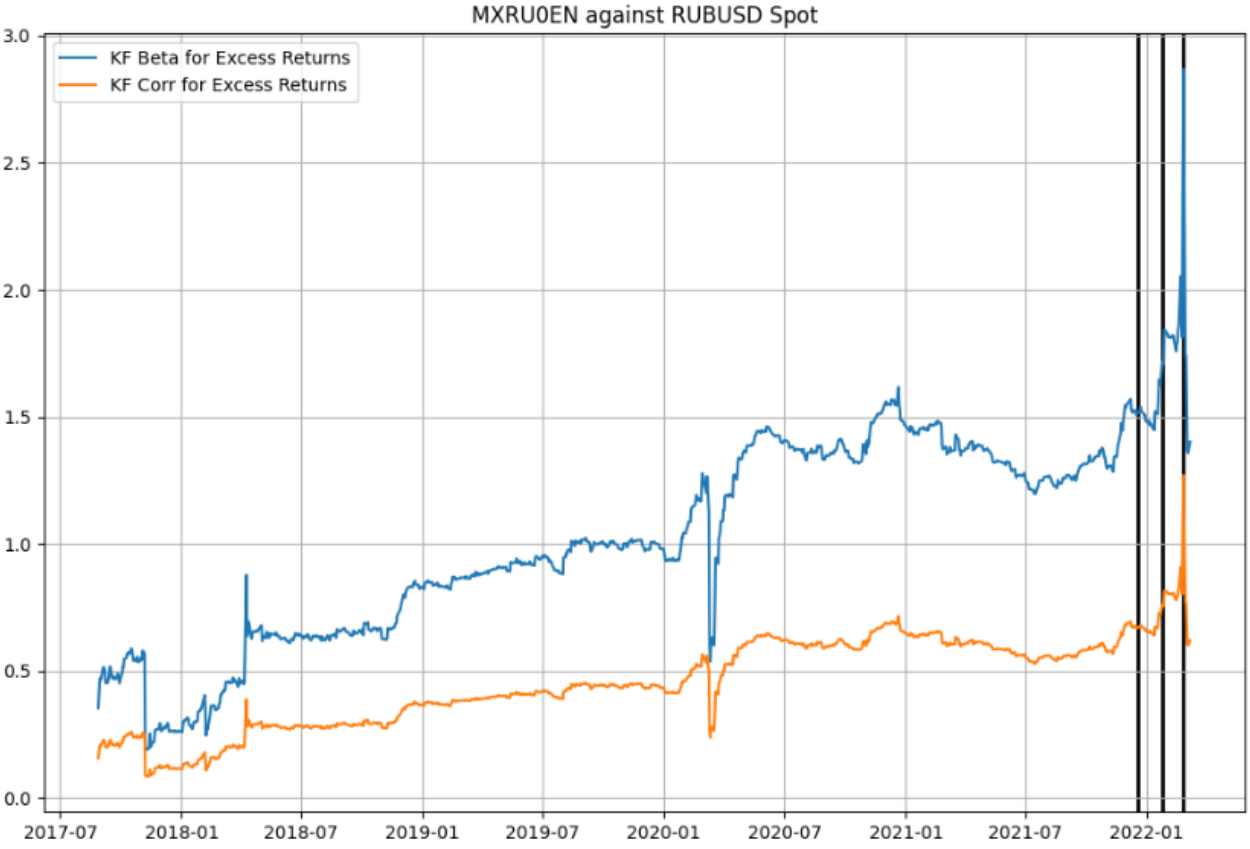
- Dec. 17, 2021: Russia presents security demands including that NATO pulls back troops and weapons from eastern Europe and bar Ukraine from ever joining.
  corr slightly drop to near-term lower bound 0.6, beta drop to 1.3 - 1.4

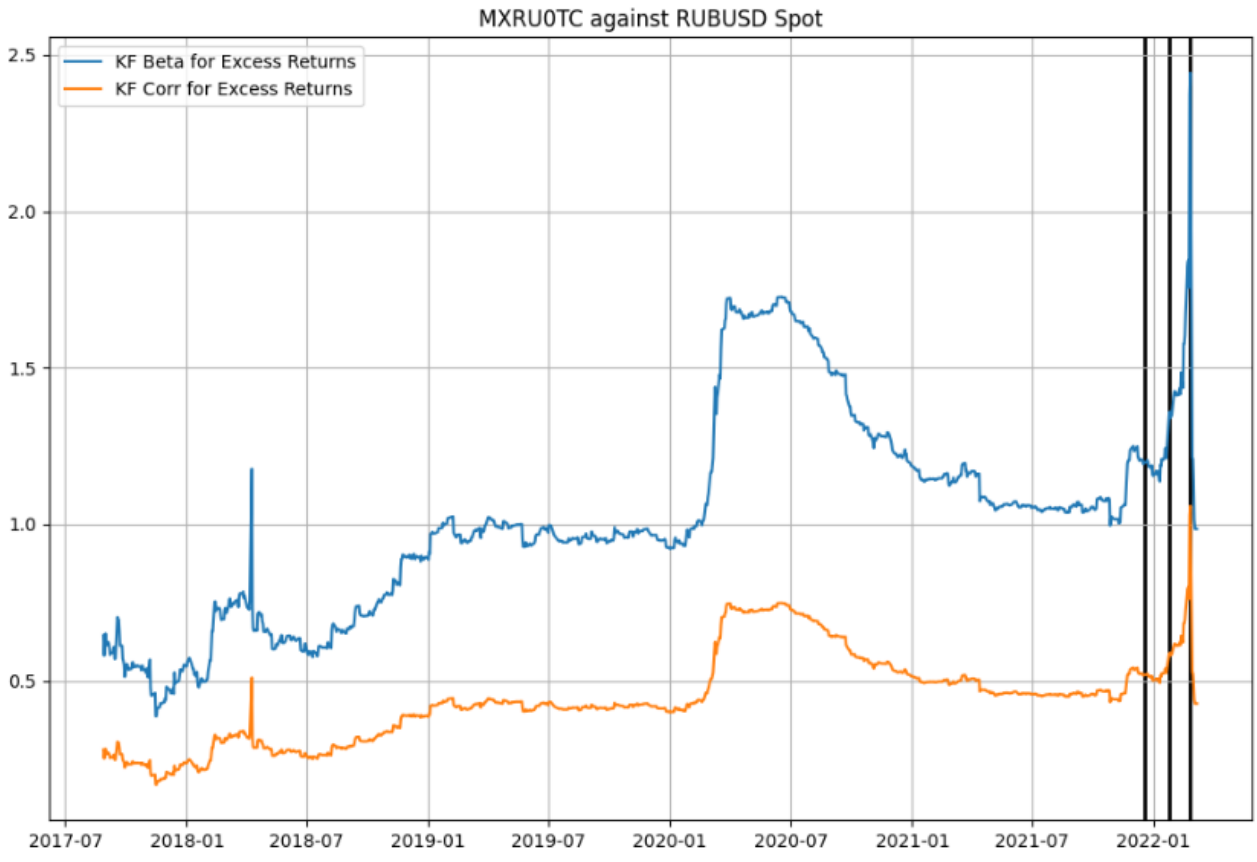
- Jan. 24, 2022: NATO puts forces on standby and reinforces eastern Europe with more ships and fighter jets.
  corr jump to 0.8, beta jump to 1.7 - 1.8

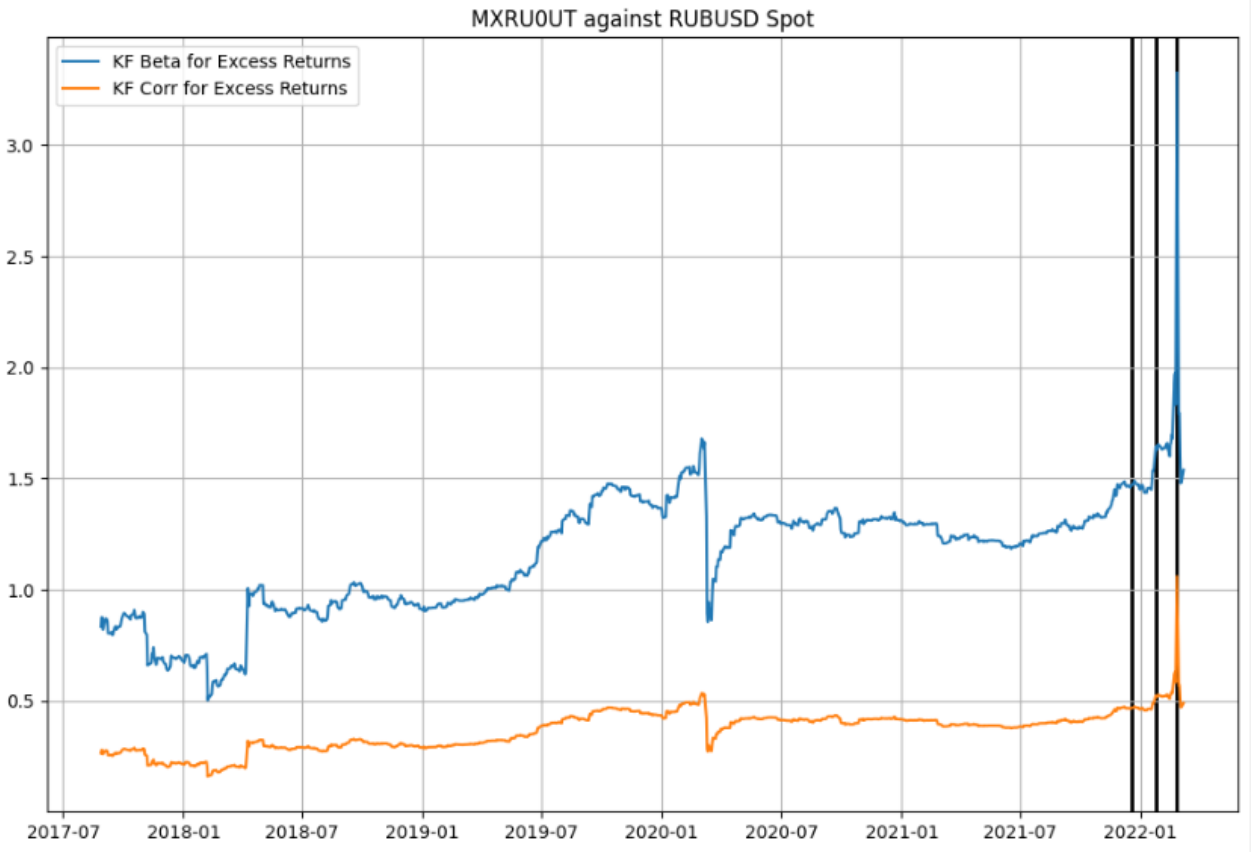
- Feb. 24: Putin authorizes "special military operations" in Ukraine. Russian forces begin missile and artillery attacks, striking major Ukrainian cities including Kyiv.
  corr jump to its theoretical maximum, beta jump above 2.5, then after one day, everything vanish in the thin air.

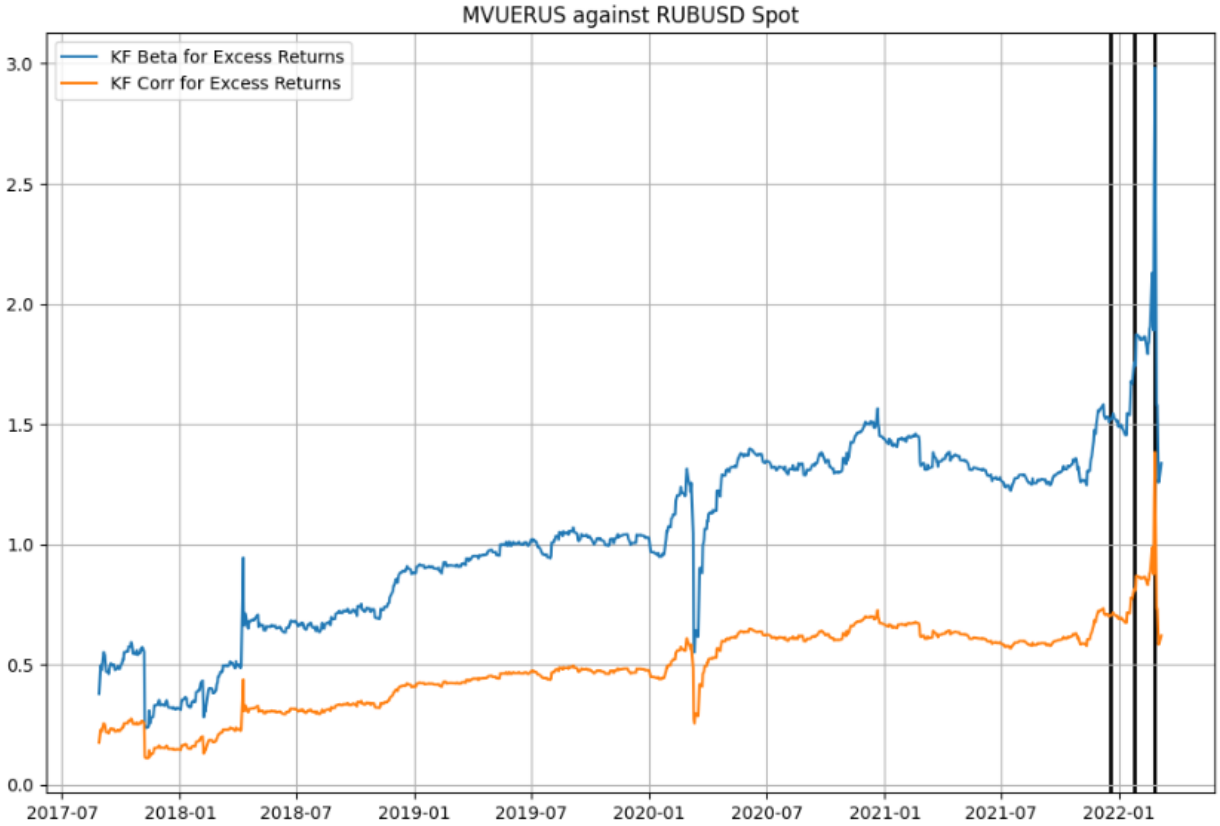
Below is the time-varying beta/corr plot for multiple indices, where the black vertical line marks the key events.

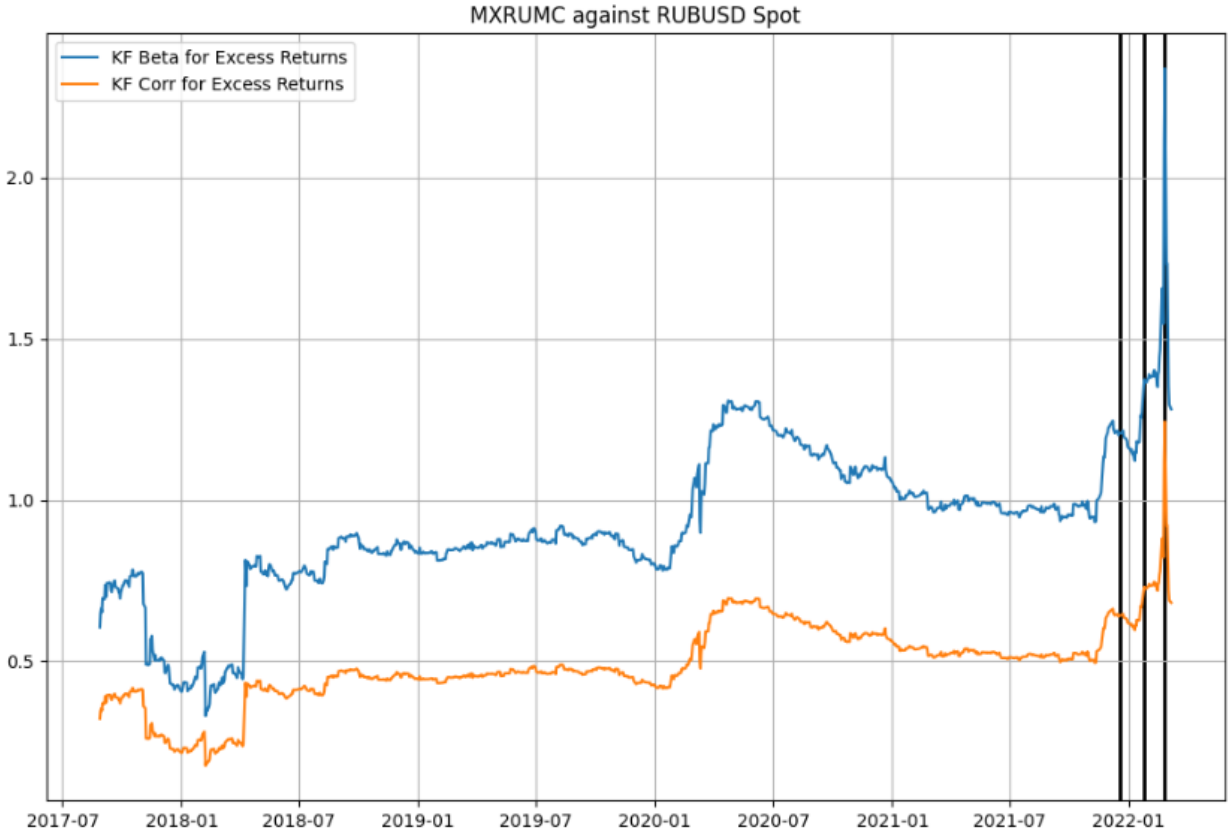

MXRUIM against RUBUSD Spot
KF Beta for Excess Returns
KF Corr for Excess Returns
3.0
2.5
2.0
1.5
1.0
0.5
2017-07
2018-01
2018-07
2019-01
2019-07
2020-01
2020-07
2021-01
2021-07
2022-01


MXRU0EN against RUBUSD Spot
KF Beta for Excess Returns
KF Corr for Excess Returns
3.0
2.5
2.0
1.5
1.0
0.5
0.0
2017-07
2018-01
2018-07
2019-01
2019-07
2020-01
2020-07
2021-01
2021-07
2022-01


MXRU0TC against RUBUSD Spot
KF Beta for Excess Returns
KF Corr for Excess Returns
2.5
2.0
1.5
1.0
0.5
2017-07
2018-01
2018-07
2019-01
2019-07
2020-01
2020-07
2021-01
2021-07
2022-01


MXRU0UT against RUBUSD Spot
KF Beta for Excess Returns
KF Corr for Excess Returns
3.0
2.5
2.0
1.5
1.0
0.5
2017-07
2018-01
2018-07
2019-01
2019-07
2020-01
2020-07
2021-01
2021-07
2022-01


MVUERUS against RUBUSD Spot
KF Beta for Excess Returns
KF Corr for Excess Returns
3.0
2.5
2.0
1.5
1.0
0.5
0.0
2017-07
2018-01
2018-07
2019-01
2019-07
2020-01
2020-07
2021-01
2021-07
2022-01


MXRUMC against RUBUSD Spot
KF Beta for Excess Returns
KF Corr for Excess Returns
2.0
1.5
1.0
0.5
2017-07
2018-01
2018-07
2019-01
2019-07
2020-01
2020-07
2021-01
2021-07
2022-01