

Is Russia Stock a Good Hedge for Ruble?

Chi Zhang

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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 and 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, e.g. TailRatio) given the RUBUSD and a set of MSCI index universe (similar to the currently 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), include daily price series and market cap as weights (in RUB). Using the security-level data, we calculated the index-level data in USD, which has also been converted into RUB and saved for future use.

3. Understanding the Data

- MSCI IMI index is mainly driven by large-cap names.
- Value starts outperforming Growth in mid-2018.
- The magnitude of the rolling window (e.g. 3m) corr is larger than the estimated corr of daily returns.
- Rank of rolling 3m corr with RUBUSD among sectors in Pre-war:

| Overall | Growth/Value | Financial/Energy | MidCap/Small Cap/Material/TeleComm | Utility | ConsumerStaple |
|---------|--------------|------------------|------------------------------------|---------|----------------|
| ~0.92 | ~0.91 | ~0.87 | ~0.78 | ~0.68 | ~0.52 |

- Rank of rolling corr with RUBUSD given various window length:

Pre-war:

| MSCI Russia in which currency | 3m | 6m | 1yr | 2yr | 3yr |
|-------------------------------|-------|-------|-------|-------|-------|
| RUB | ~0.8 | ~0.75 | ~0.73 | ~0.65 | ~0.78 |
| USD | ~0.92 | ~0.91 | ~0.9 | ~0.81 | ~0.93 |

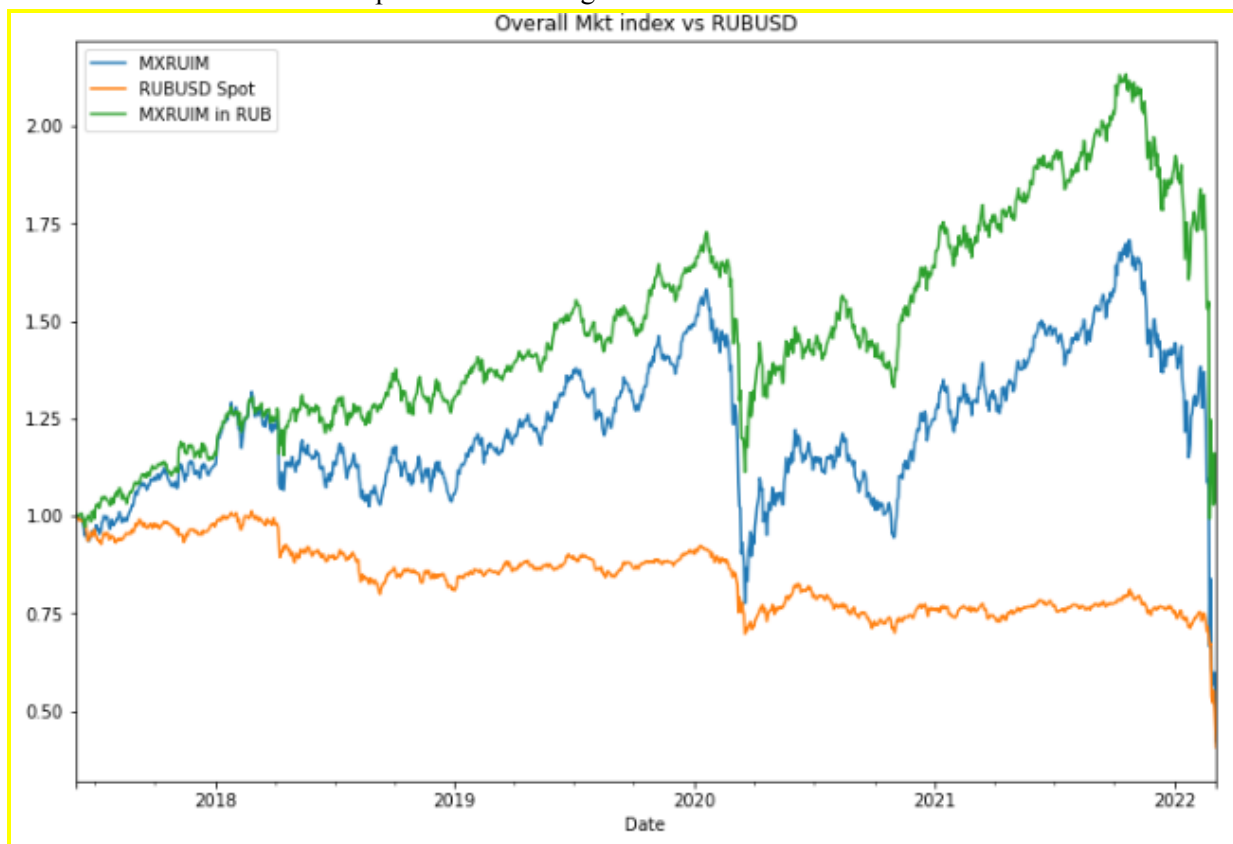
Post-war:

| MSCI Russia in which currency | 5d | 11d | 21d | 42d |
|-------------------------------|-------|-------|-------|-------|
| RUB | ~0.22 | ~0.65 | ~0.29 | ~0.17 |
| USD | ~0.93 | ~0.93 | ~0.87 | ~0.96 |

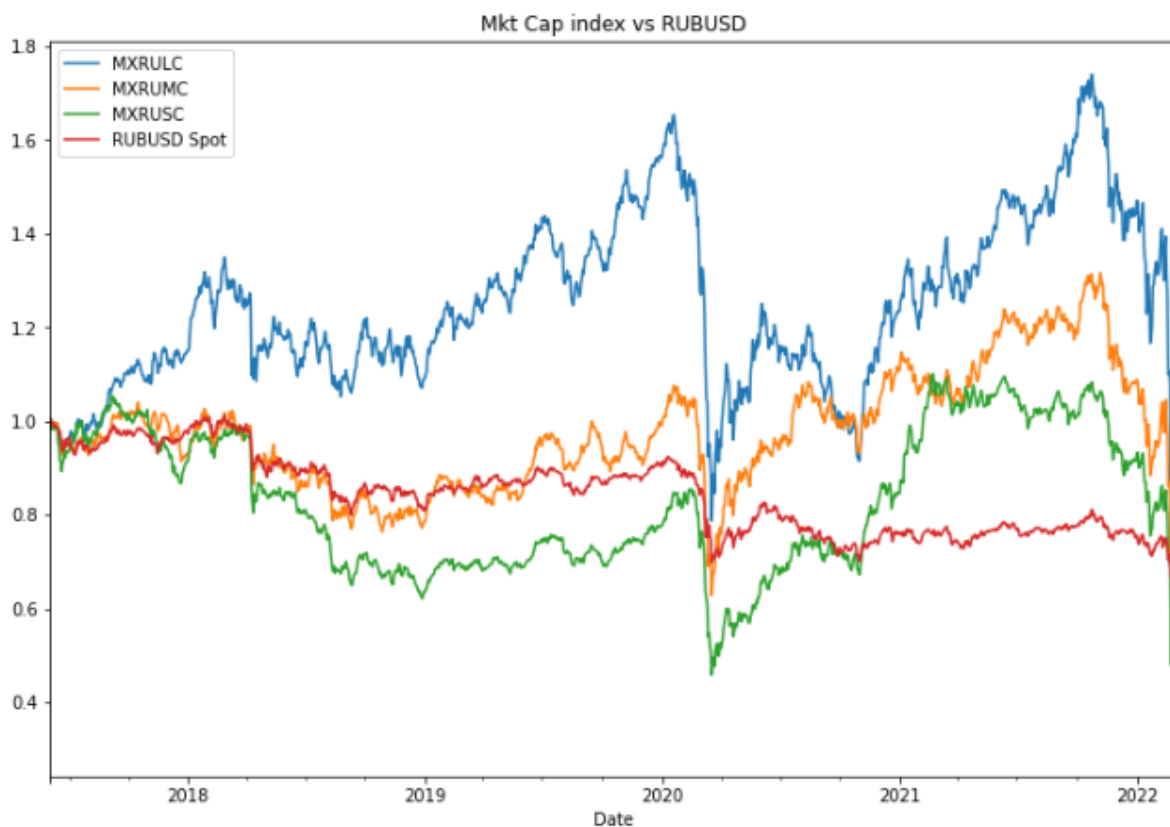
- As an EM market, a large positive corr with its domestic currency shows the stock price (in USD) could be reflected by the flow in/out of the FX market. However, this does not necessarily mean an appreciating RUB will mean a positive absolute return for Russian stocks, because FX is one of the multiple risk factors that drive Russian stocks. We can say an appreciating RUB could contribute to an upward shift of Russian stock returns holding all else being equal, but the overall Russian stock performance could also be driven by other stock market factors including fundamentals (P/E), domestic macroeconomic

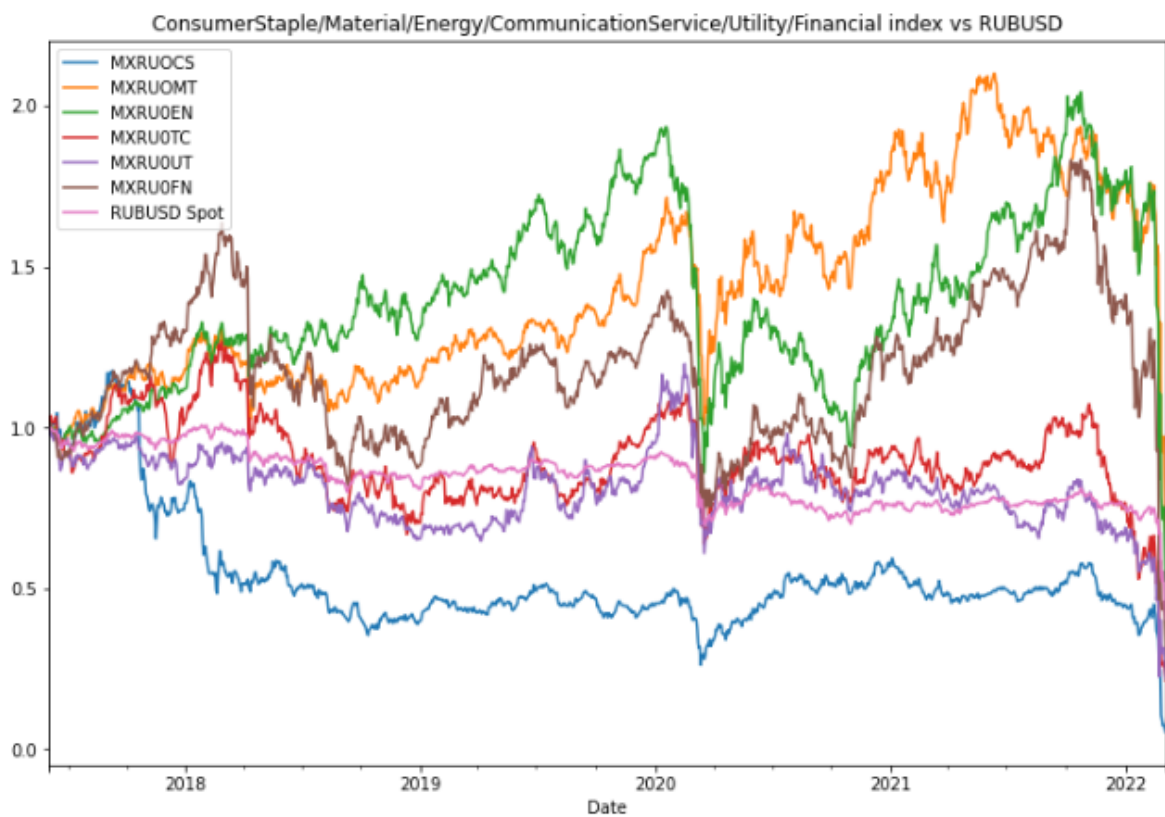
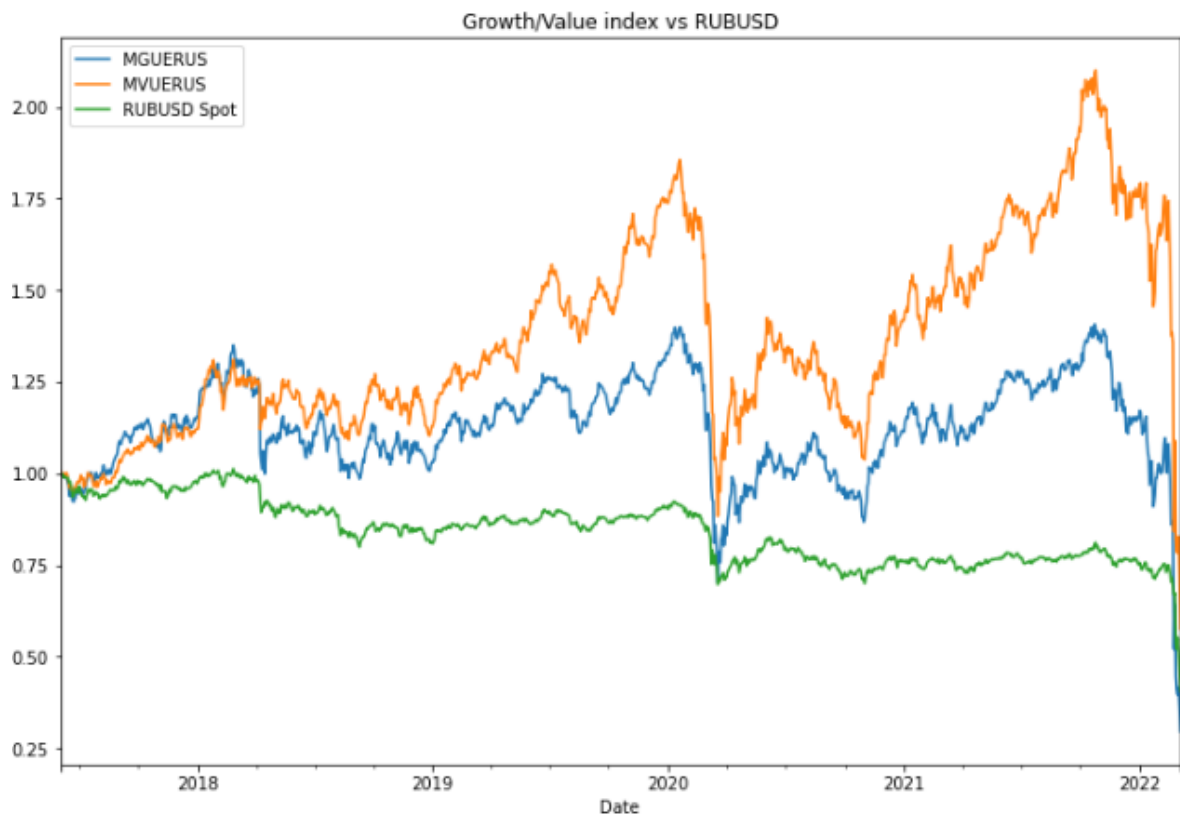
environment (aggregate demand), monetary policy (interest rate) and etc. See the corr plot of rolling window return given different window lengths at the end of this section.

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

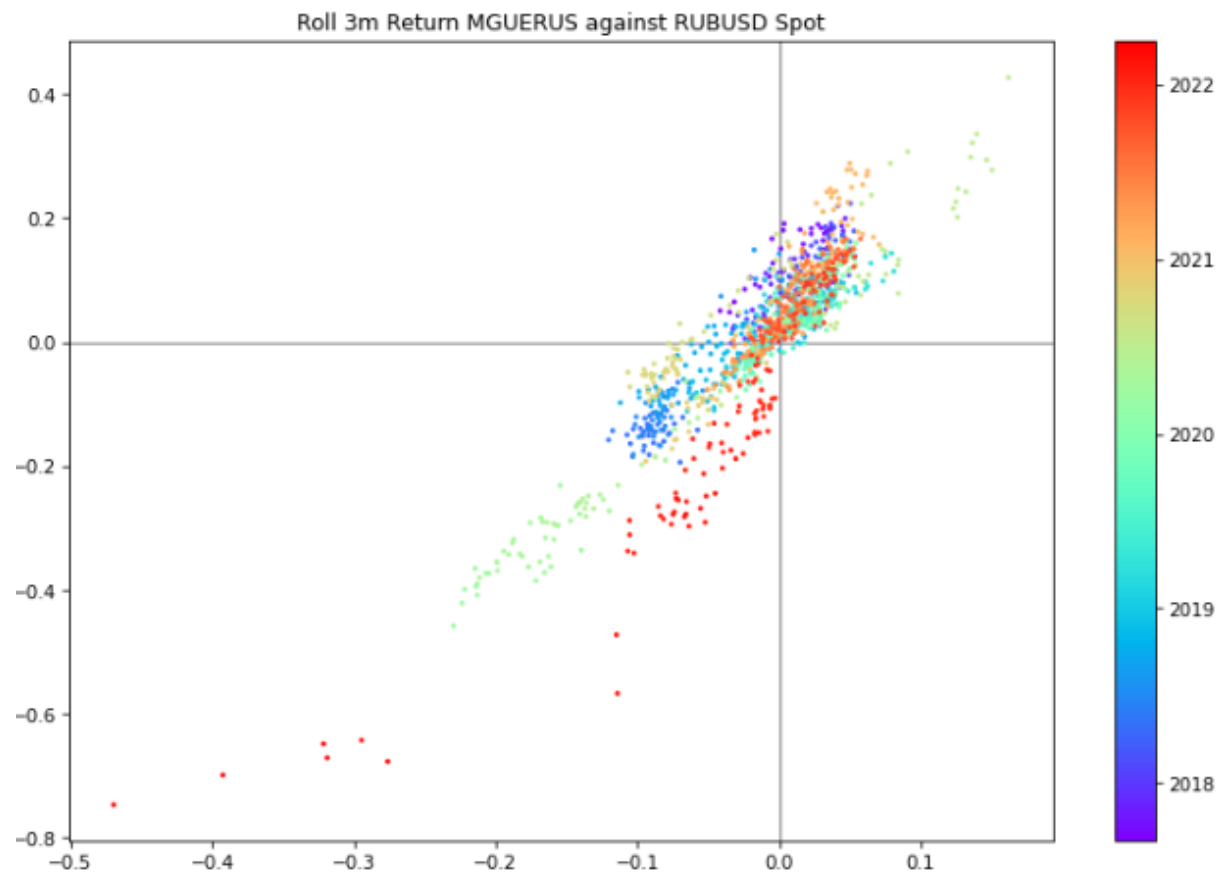
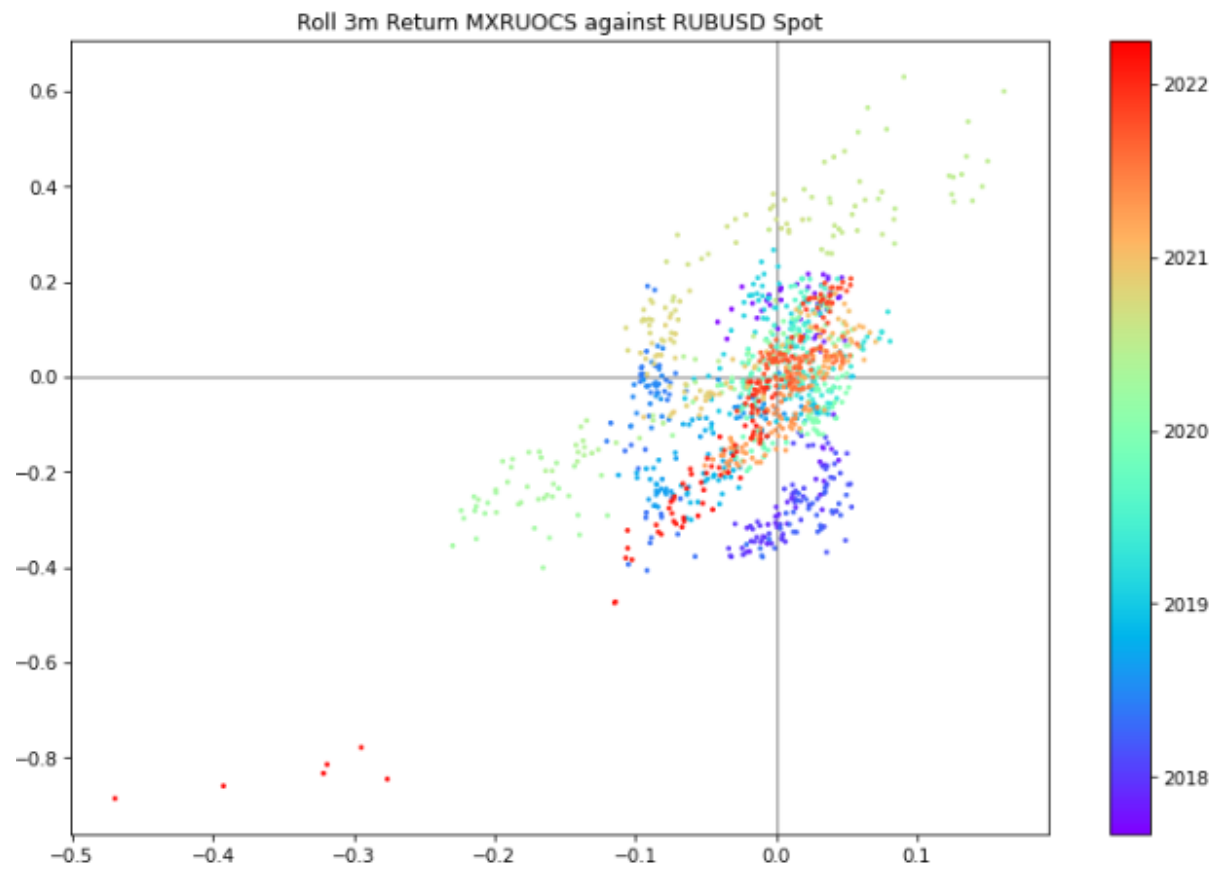


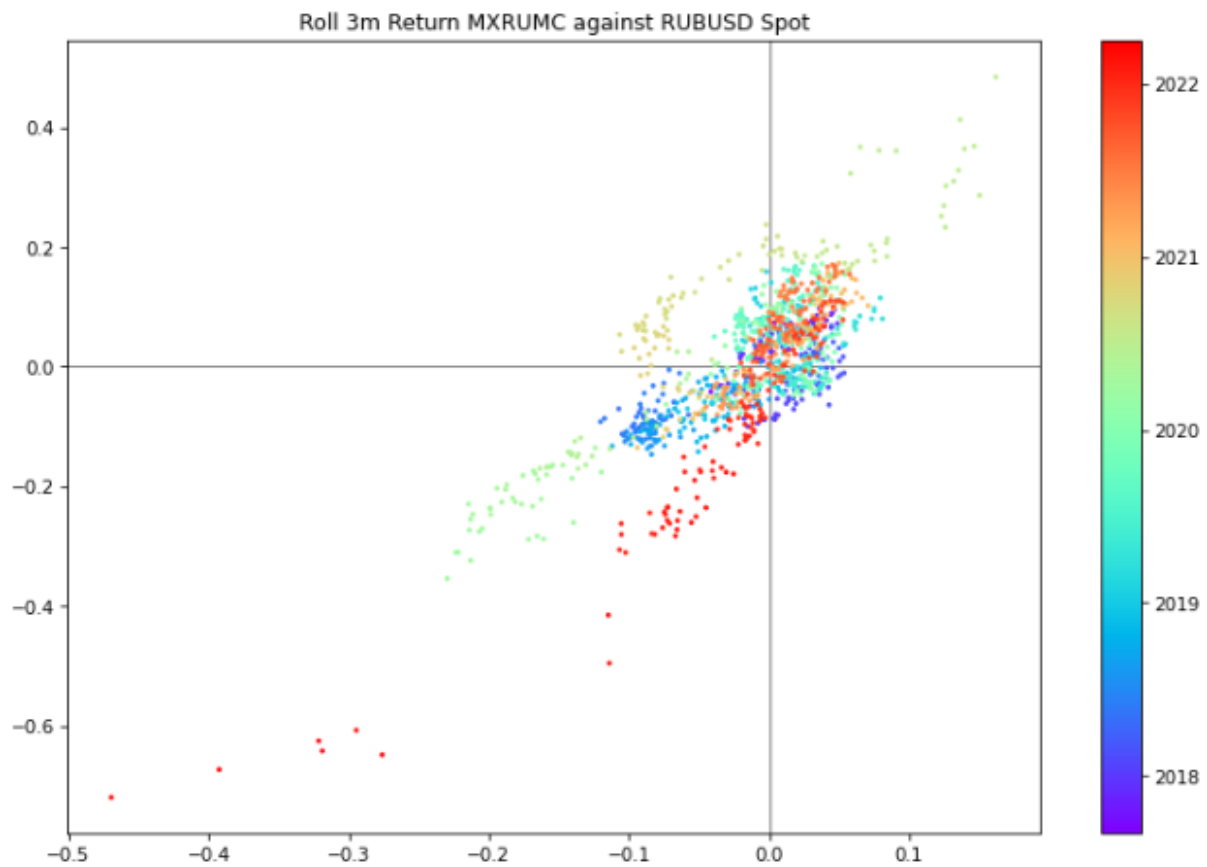
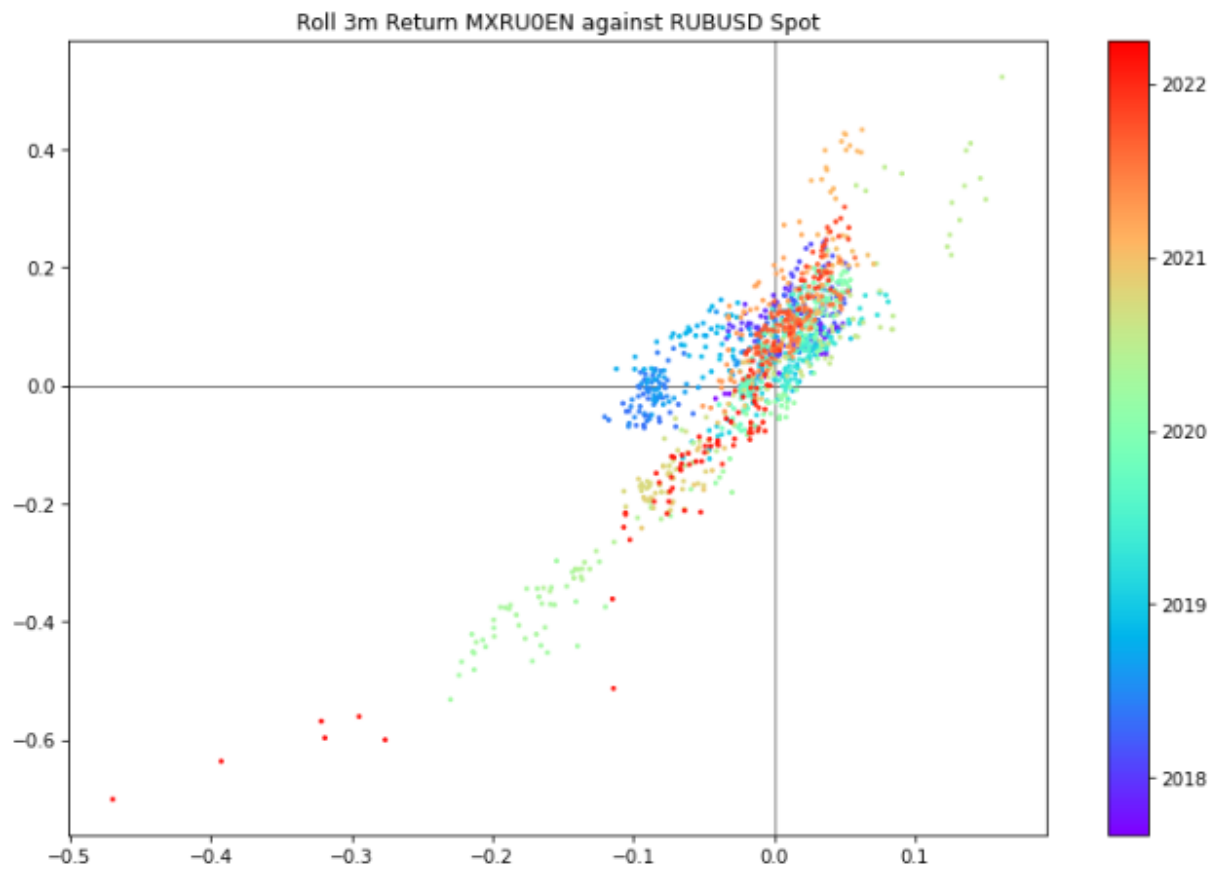
For the above overall mkt index, also plot the performance of MXRUIM in RUB

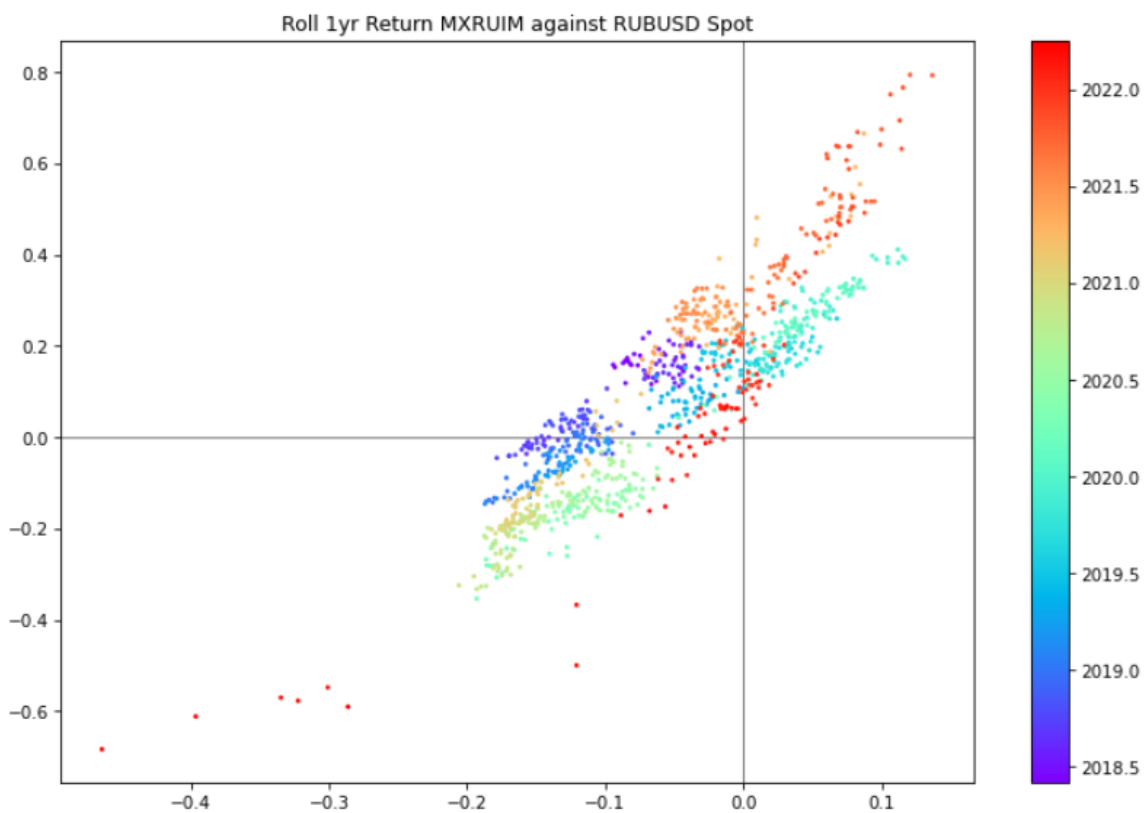
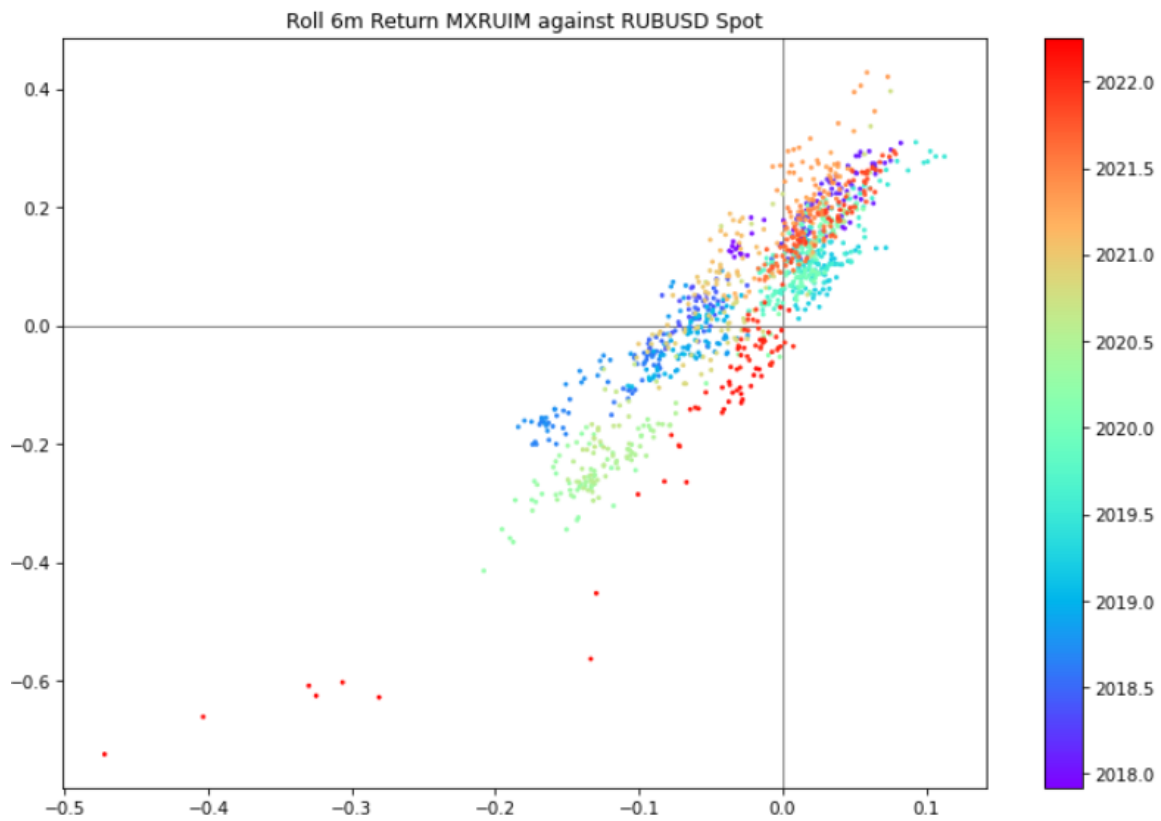




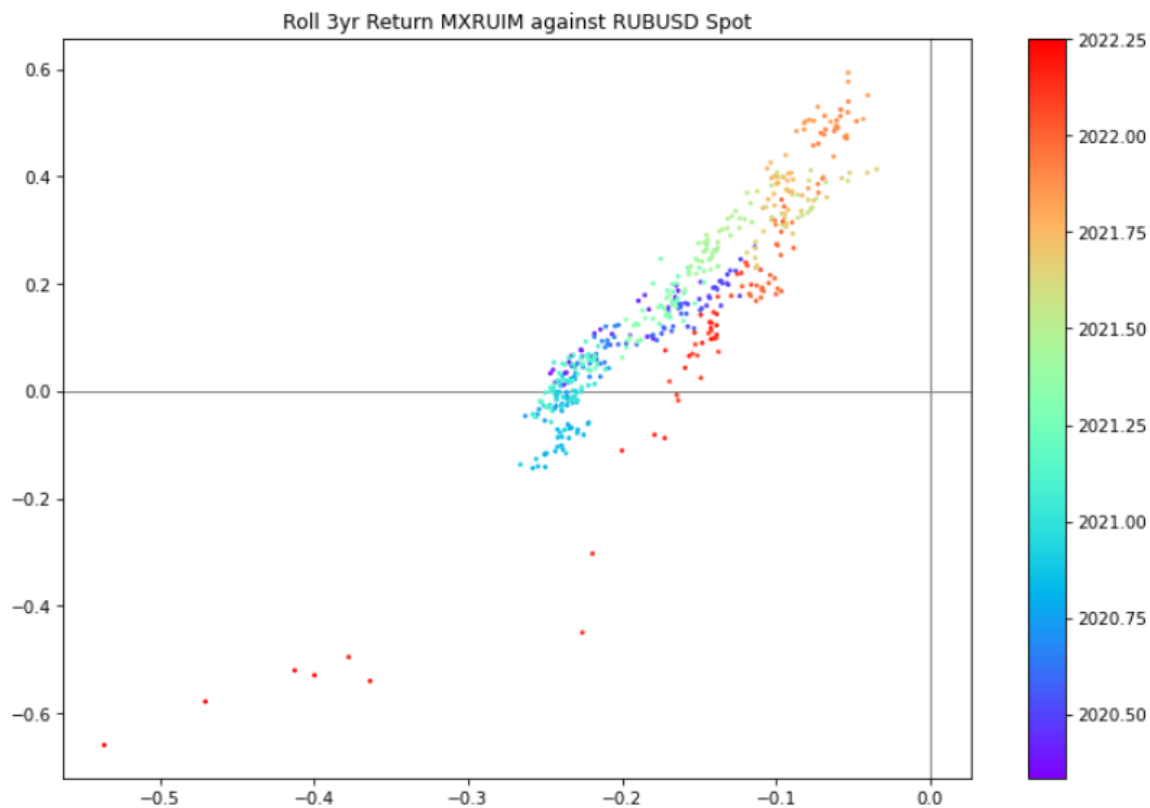
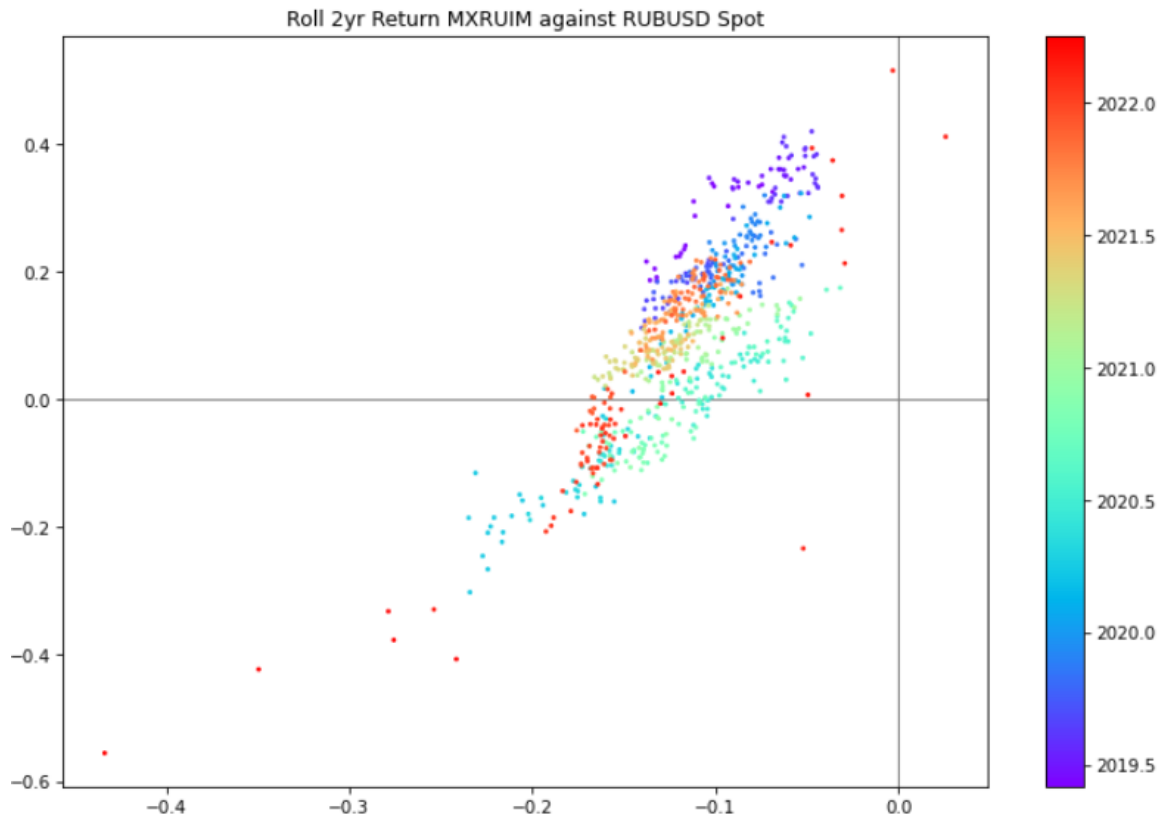
Below is the rolling 3m corr plot against RUBUSD for diff sectors, with colorbar showing the time progression.







A strong U.S. dollar generally harms the economies of emerging nations, such as Russia. Russia is reliant on foreign investment and foreign capital, both of which can evaporate when the dollar gains in value. The other way around: a weak U.S. dollar creates an incentive for companies to invest in emerging markets.



As the time window lengthens, the proportion of data points in the second quadrant increases: RUB is in its OWN depreciating cycle, but the Russian stock is in its OWN bull cycle, but their pairwise correlation is firmly positive. For example: focusing on those dark blue points, the positive slope is significant in this local cluster.

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 (Overall mkt index 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.

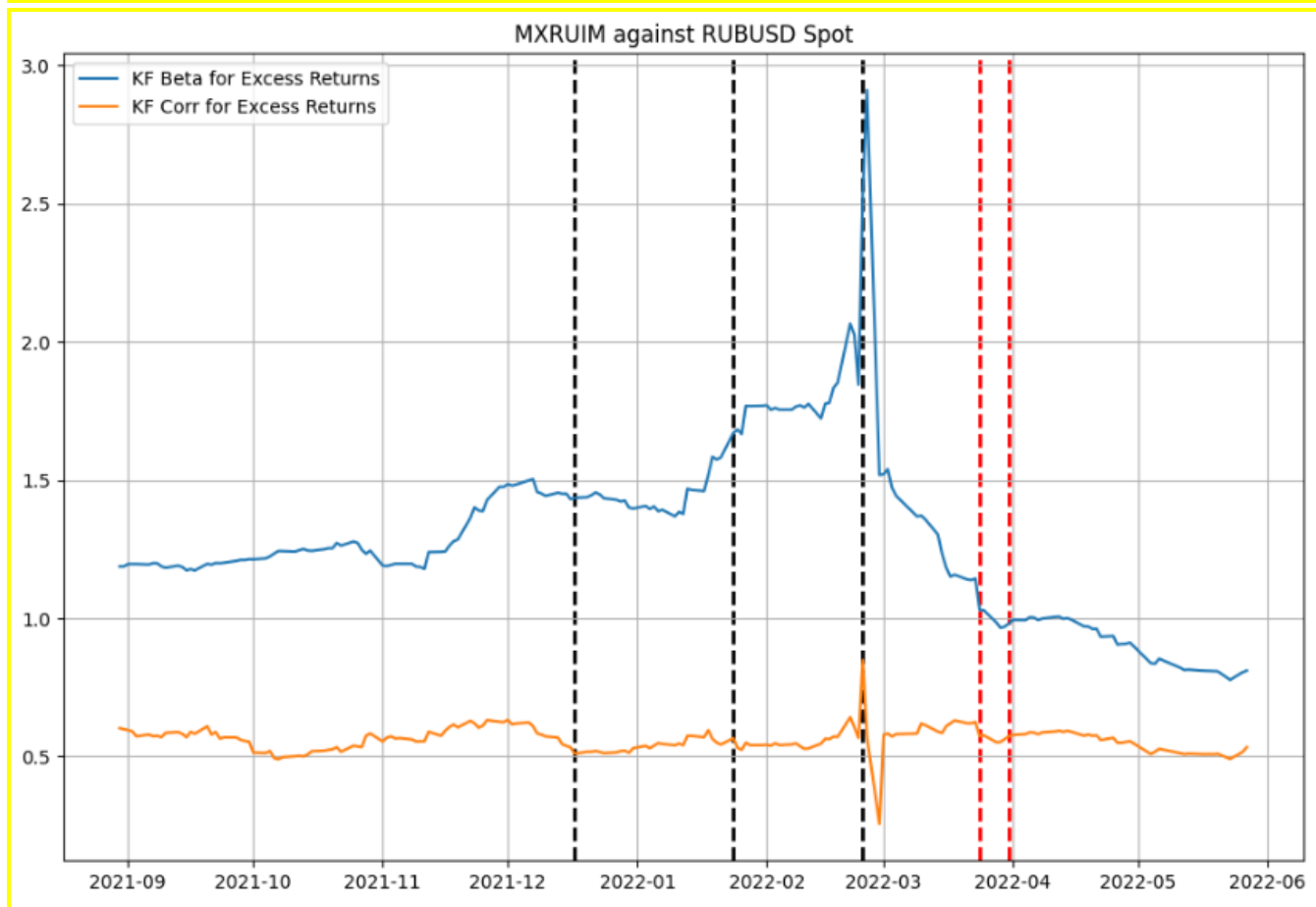
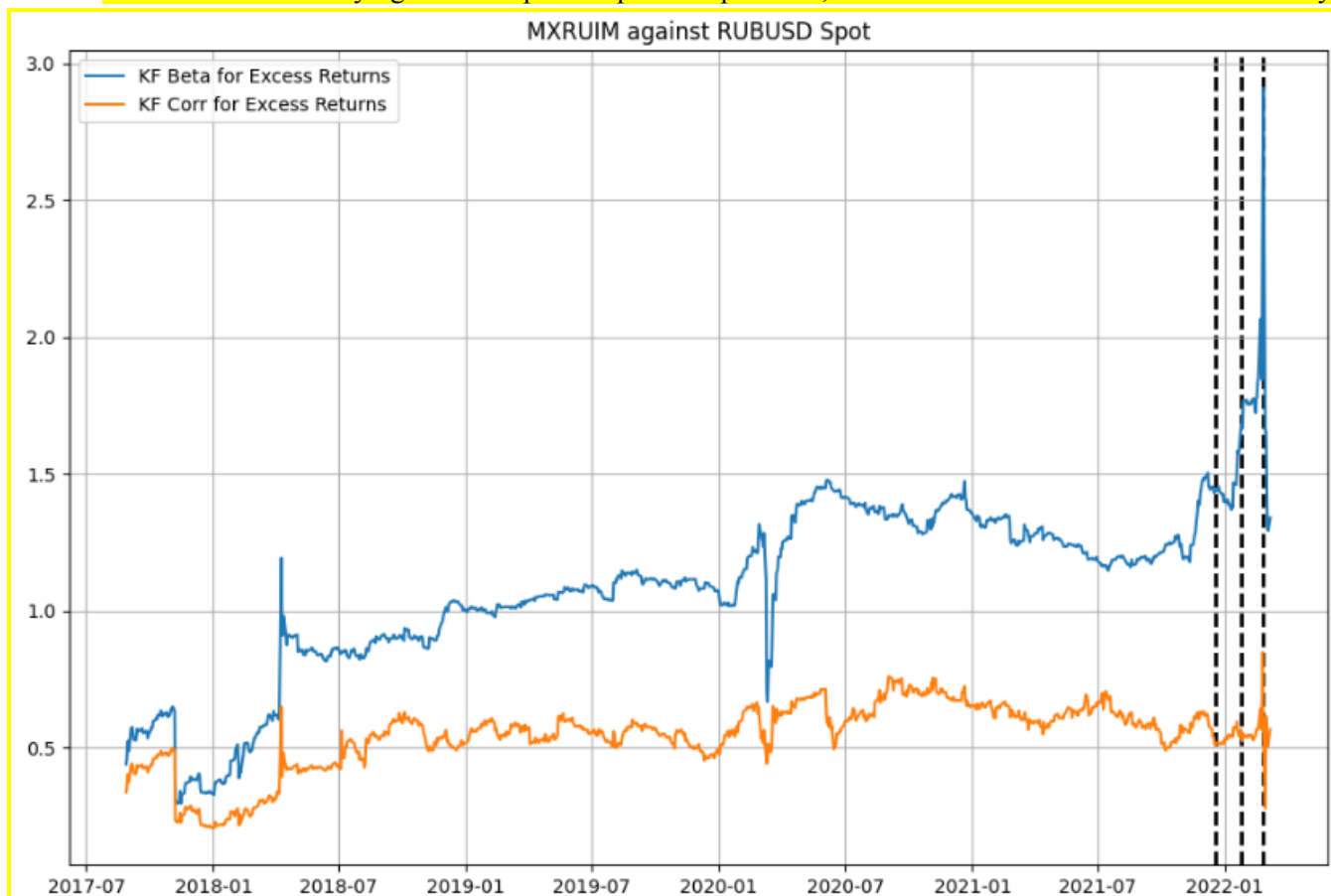
Pre-war:

- 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 starts with a slight dip to 0.5, then quickly jump back to 0.6
beta follows a similar trajectory, finally arriving at 1.7
- Jan. 24, 2022: NATO puts forces on standby and reinforces eastern Europe with more ships and fighter jets.
corr keeps around the same level, then start climbing as the breakout arrives
beta driving towards above 2.0
- Feb. 24: Putin authorizes "special military operations" in Ukraine. Russian forces begin missile and artillery attacks, striking major Ukrainian cities including Kyiv.
Corr pulses to its theoretical maximum, beta jump above 2.5, then after one day, everything vanishes in the thin air.

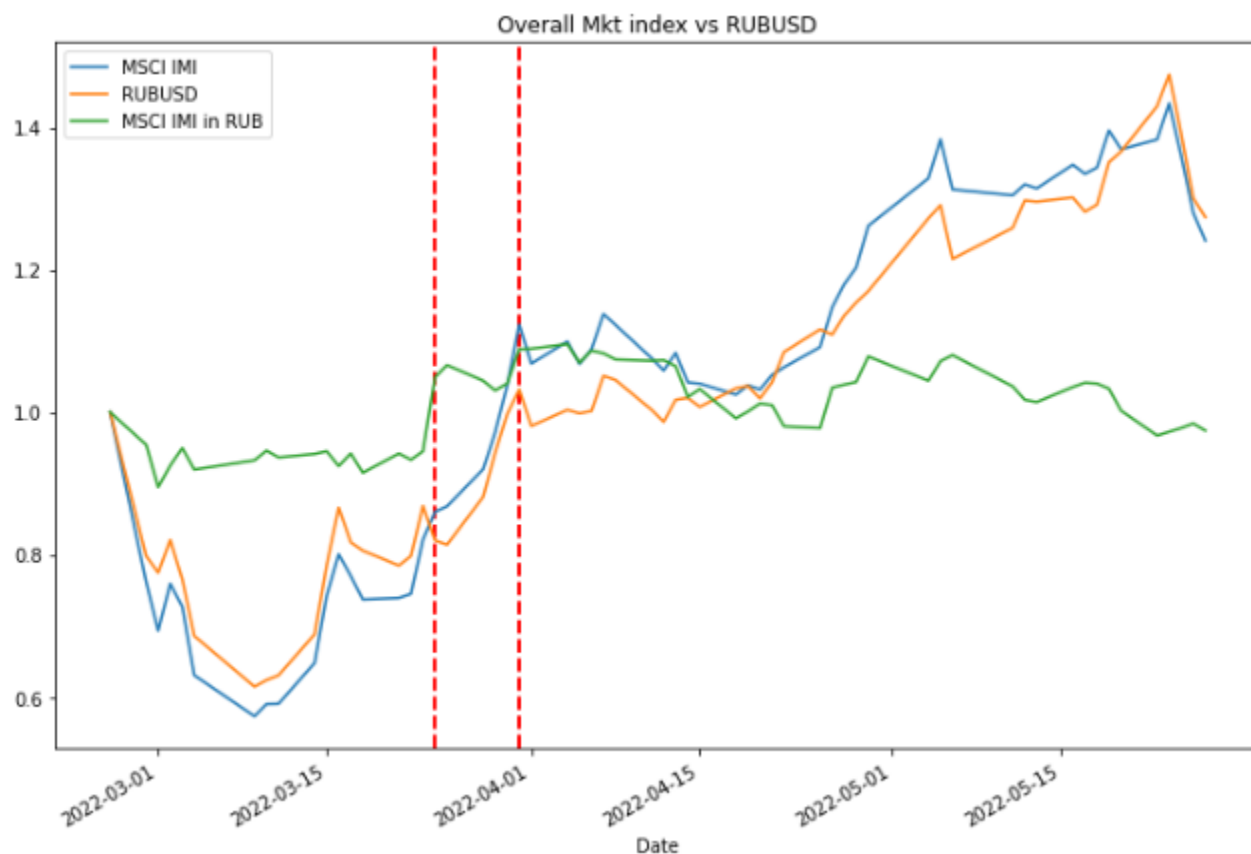
Post-war:

- Feb. 25 - restricted reopen:
corr drains (below 0.3), then lift to the pre-war level (0.6), similar to early 2022
Beta drives down towards 1.0, similar to early 2019
- part of the restrictions lifted - till now:
corr and beta keep moving down, corr to 0.5, beta to 0.8

Below is the time-varying beta/corr plot for pre- and post-war, where the black and res lines mark the key events.

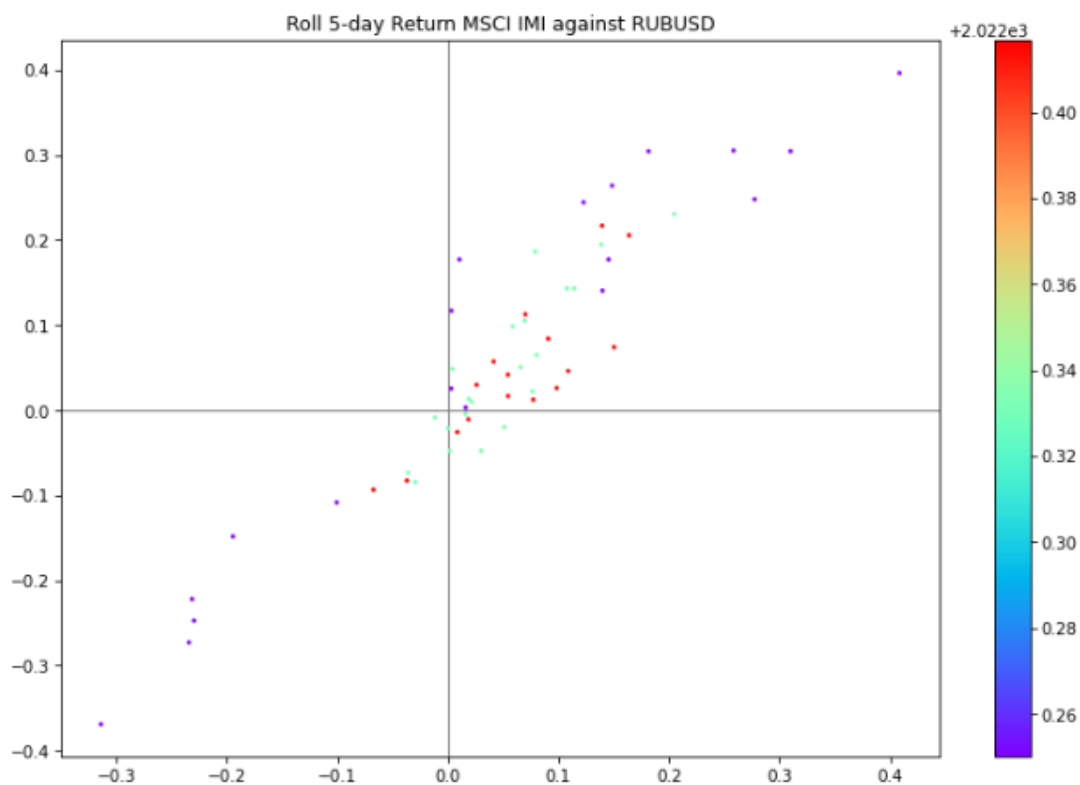


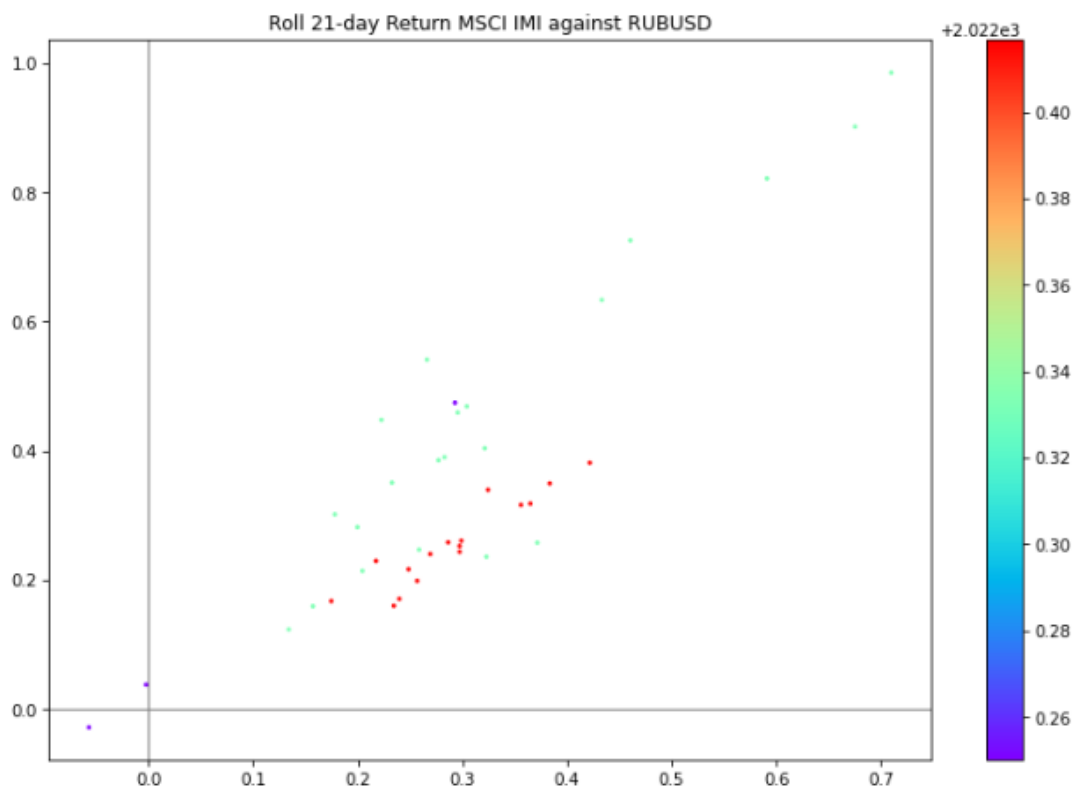
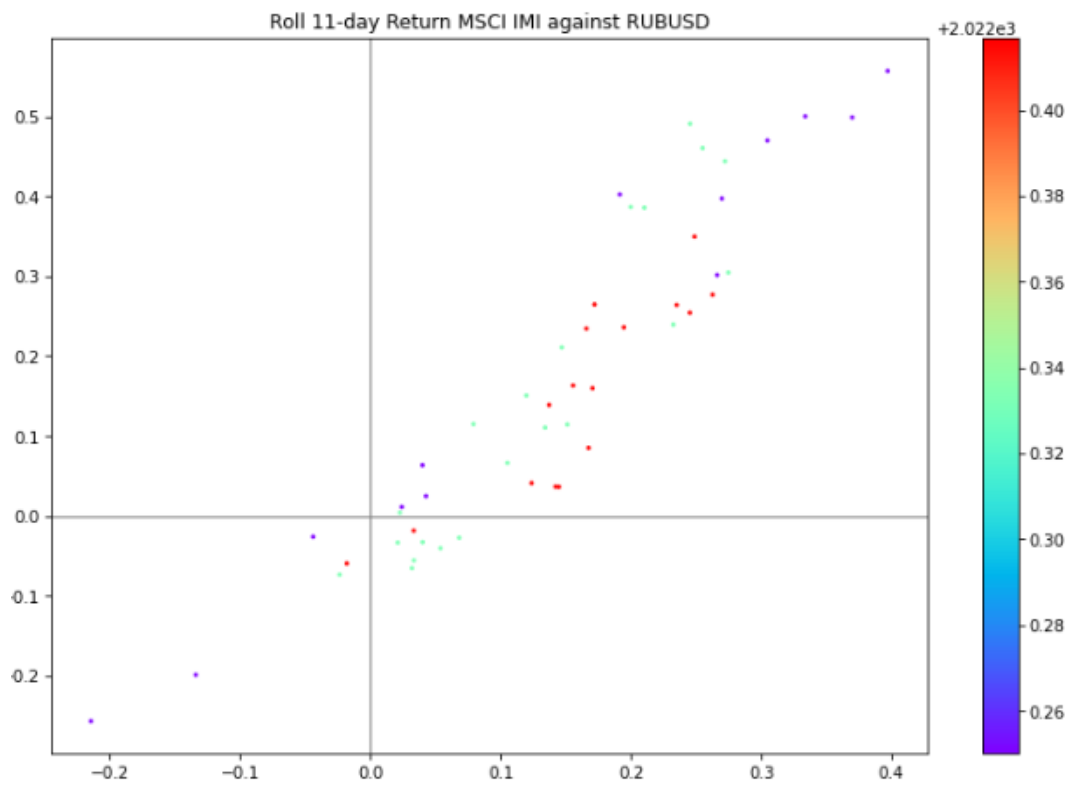
5. Some Other Plots in Post-War

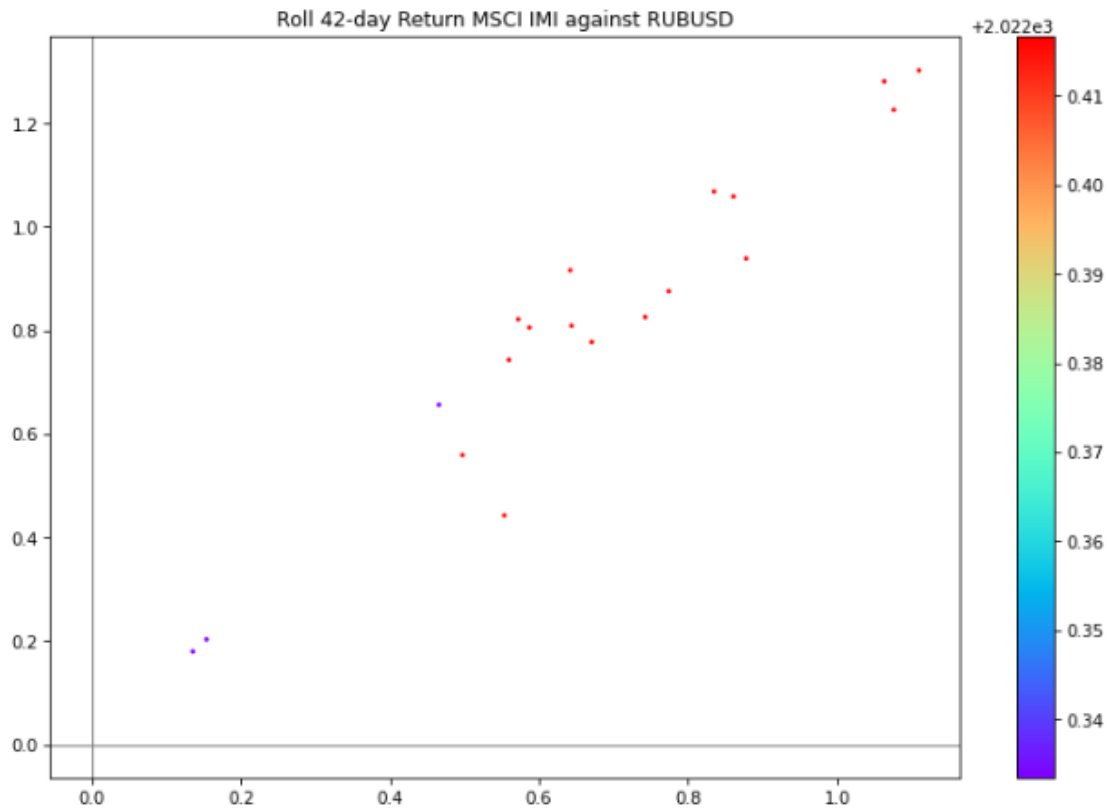


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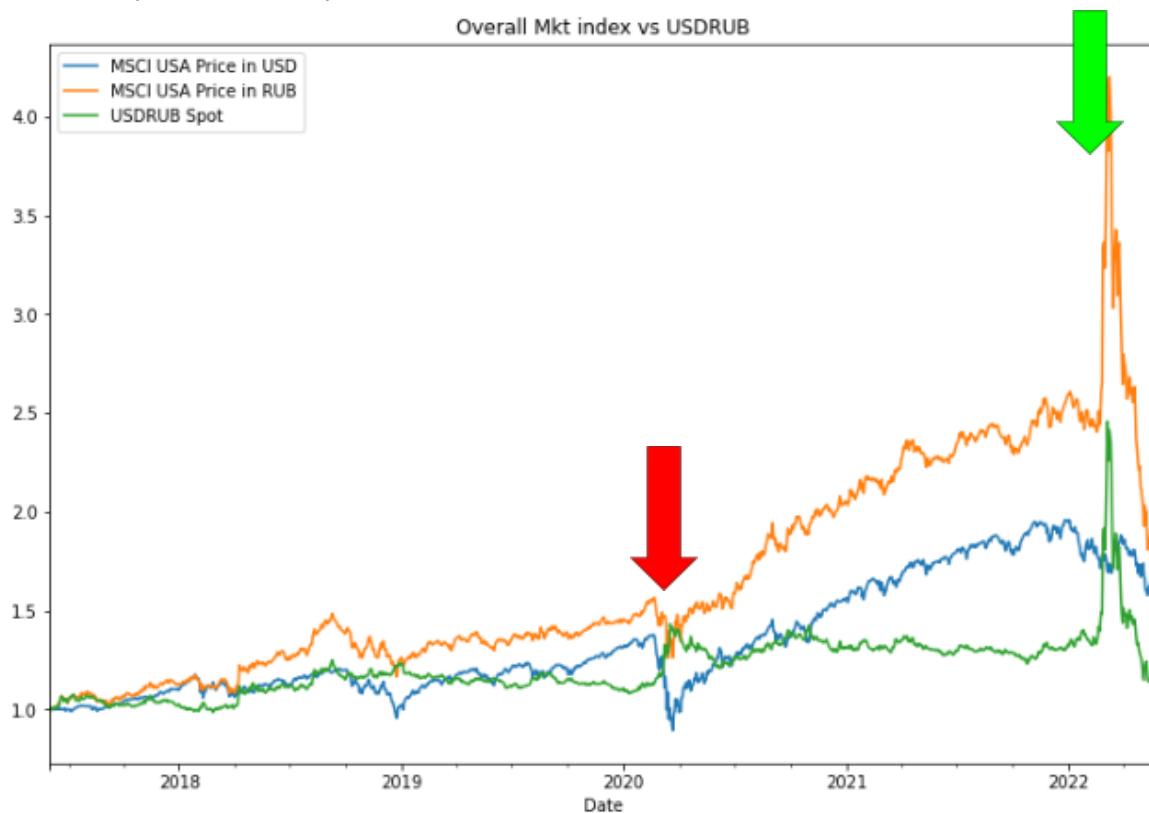
See below for the rolling corr given diff window length.







6. The Other-way Around: the Dynamics of USDRUB and MSCI USA for a Russia-based Investor



There is a negative corr between MSCI USA in USD and USDRUB (e.g. -0.47 for rolling 3m), but not the case for MSCI USA in RUB (e.g. 0.57 for rolling 3m). The logic is pretty simple: as one of the largest economies in the world and the most well-known DM market, the strength of USD is mainly driven by the risk-neutral yield of USD interest rate

products, instead of the risk premium associated with the geopolitical factors in the States. Although some of the negative corr and the intrinsic hedging effect may be wiped out when converting the MSCI USA index into RUB, a Russia-based investor could still get quite a large amount of hedging and diversification benefit from the stock-FX pair.

For that audience without any practical working experience in FX markets, I pointed out two USDRUB spiking episodes in the above figure.

The red arrow indicates a large negative corr between the stock-FX pair, when the MSCI USA index in RUB is mainly driven by risk appetite around the covid break (investors flow back to US, the dollar gets stronger, US stock makes a huge dip as a risky asset class). The green arrow indicates a large positive corr, when the MSCI USA index in RUB is mainly driven by the geopolitical risk premium embedded in the Ruble (rates term premium drives the Ruble to depreciate).

See below the rolling corr with USDRUB given diff window length.

| MSCI USA in which currency | 3m | 6m | 1yr | 2yr | 3yr |
|----------------------------------|---------|---------|---------|-------|---------|
| USA | ~(0.47) | ~(0.36) | ~(0.34) | ~0.15 | ~(0.35) |
| RUB | ~0.57 | ~0.53 | ~0.41 | ~0.58 | ~0.61 |

