

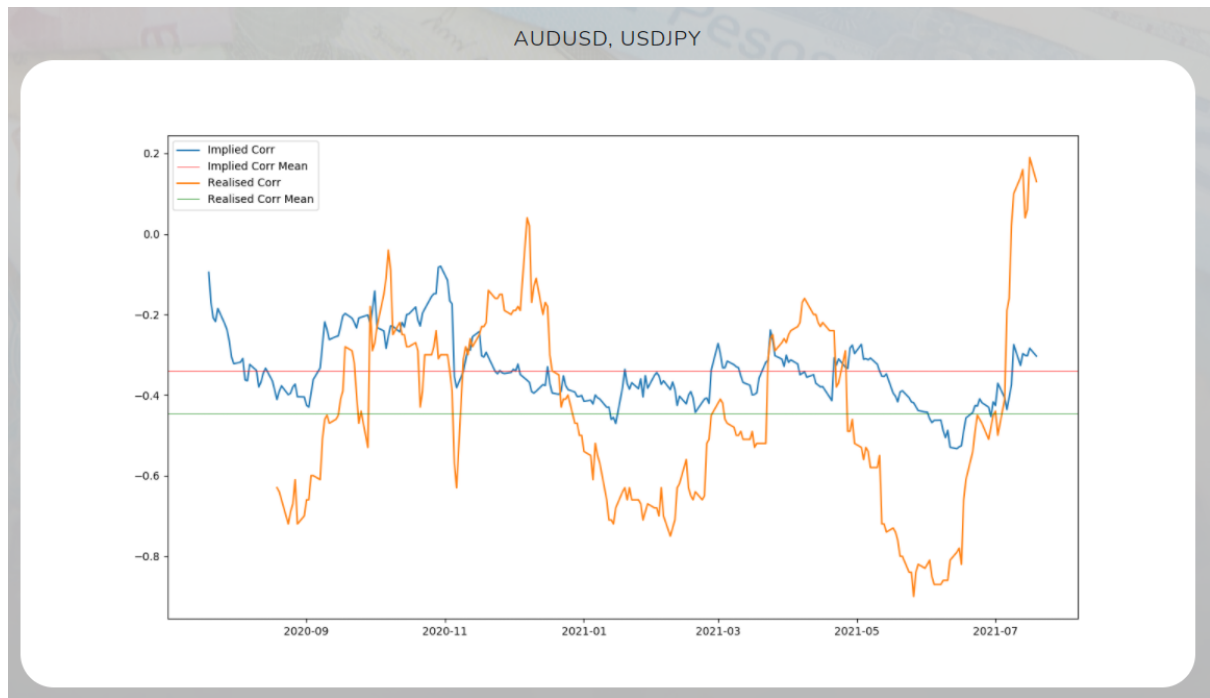
Market Observations using the App:

(Using a 1m tenor and a 1y lookback period)

- Within G10:
 - While correlations between [EUR, SEK], [AUD, NZD], and [AUD, GBP] are quite high, the associated Z scores are quite benign indicating that these correlations do not stand out from a historical viewpoint

Realised Correlation									
	EURUSD	USDJPY	GBPUSD	AUDUSD	NZDUSD	USDCAD	USDCHF	USDNOK	USDSEK
EURUSD	1.0	-0.38	0.67	0.57	0.58	-0.58	-0.81	-0.73	-0.89
USDJPY	-0.38	1.0	-0.0	0.15	0.1	-0.22	0.61	-0.17	0.19
GBPUSD	0.67	-0.0	1.0	0.84	0.71	-0.77	-0.47	-0.81	-0.76
AUDUSD	0.57	0.15	0.84	1.0	0.92	-0.88	-0.36	-0.88	-0.72
NZDUSD	0.58	0.1	0.71	0.92	1.0	-0.79	-0.31	-0.81	-0.69
USDCAD	-0.58	-0.22	-0.77	-0.88	-0.79	1.0	0.43	0.86	0.72
USDCHF	-0.81	0.61	-0.47	-0.36	-0.31	0.43	1.0	0.43	0.71
USDNOK	-0.73	-0.17	-0.81	-0.88	-0.81	0.86	0.43	1.0	0.81
USDSEK	-0.89	0.19	-0.76	-0.72	-0.69	0.72	0.71	0.81	1.0

- JPY Crosses, on the other hand, are interesting as correlations in absolute sense are low but Z-scores are quite high
 - USDJPY and other G10 pairs (AUD, NZD, NOK, GBP, CAD) are displaying high Z scores where correlations are quite deviated from their mean, with a Z score of 2.53 between AUDUSD and USDJPY and a correlation of only 0.2 which is quite far away from its historical mean of around -0.5. Also this correlation has recently turned positive (which means that AUDUSD and USDJPY move similarly)



- In recent times, the difference between the realized and implied correlation of JPY with other G10 currencies has also increased, indicating the vol market has not fully priced the increase in realized correlation

Realised vs Implied Correlation Difference									
	EURUSD	USDJPY	GBPUSD	AUDUSD	NZDUSD	USDCAD	USDCHF	USDNOK	USDSEK
EURUSD	0.00	0.20	0.05	-0.04	-0.03	-0.03	-0.06	-0.03	-0.09
USDJPY	0.20	0.00	0.29	0.47	0.47	-0.39	-0.13	-0.41	-0.10
GBPUSD	0.05	0.29	0.00	0.15	0.03	-0.18	-0.04	-0.15	-0.13
AUDUSD	-0.04	0.47	0.15	0.00	0.08	-0.19	0.14	-0.26	-0.05
NZDUSD	-0.03	0.47	0.03	0.08	0.00	-0.11	0.21	-0.14	-0.02
USDCAD	-0.03	-0.39	-0.18	-0.19	-0.11	0.00	-0.01	0.19	0.13
USDCHF	-0.06	-0.13	-0.04	0.14	0.21	-0.01	0.00	-0.09	0.09
USDNOK	-0.03	-0.41	-0.15	-0.26	-0.14	0.19	-0.09	0.00	0.03
USDSEK	-0.09	-0.10	-0.13	-0.05	-0.02	0.13	0.09	0.03	0.00

- Oil vs FX:
 - The correlation of NOK with oil is quite volatile, with a strong negative correlation of -0.8 in April and highs of 0.2 in March. Currently the correlation is around -0.3 which is just above its historical average
 - The correlation of CAD with oil is also volatile and fluctuates between 0 and -0.8 and is currently around its mean at -0.38

- The correlation of Asian currencies with oil is not that significant, with low Z scores and correlations that range from -0.1 to 0.1
- Equity vs FX:
 - The correlation between USDJPY and SPX is quite deviated from its mean, currently at 0.26 compared to its mean of around -0.1
 - The correlation between USDJPY and XAU is also quite deviated from its mean, with a Z score of around 2.94
 - Among the Asian currencies, SGD has a relatively strong correlation with SPX of -0.61 while others have a lower correlation—KRW, for example, has a correlation of 0.04
 - With a Z score of 1.5, the correlation between AUD and SPX is quite high at 0.78, following the upward trend it has been on since January

NEW	Realised Correlation														
	EURUSD	USDJPY	GBPUSD	AUDUSD	NZDUSD	USDCAD	USDCHF	USDNOK	USDSEK	SPX	CCMP	NKY	SX5E	SHCOMP	
EURUSD	1.0	-0.39	0.67	0.57	0.58	-0.58	-0.81	-0.73	-0.89	0.41	0.31	-0.18	0.24	-0.36	
USDJPY	-0.39	1.0	-0.0	0.15	0.1	-0.22	0.61	-0.16	0.19	0.26	0.19	0.24	0.35	0.51	
GBPUSD	0.67	-0.0	1.0	0.84	0.71	-0.77	-0.47	-0.81	-0.76	0.73	0.63	-0.23	0.49	-0.16	
AUDUSD	0.57	0.15	0.84	1.0	0.92	-0.88	-0.36	-0.88	-0.71	0.78	0.67	0.03	0.65	-0.14	
NZDUSD	0.58	0.1	0.71	0.92	1.0	-0.79	-0.31	-0.81	-0.69	0.65	0.49	0.03	0.61	-0.21	
USDCAD	-0.58	-0.22	-0.77	-0.88	-0.79	1.0	0.43	0.86	0.71	-0.69	-0.56	-0.1	-0.64	0.13	
USDCHF	-0.81	0.61	-0.47	-0.36	-0.31	0.43	1.0	0.43	0.71	-0.22	-0.15	0.17	-0.05	0.48	
USDNOK	-0.73	-0.16	-0.81	-0.88	-0.81	0.86	0.43	1.0	0.81	-0.77	-0.64	0.04	-0.71	0.11	
USDSEK	-0.89	0.19	-0.76	-0.71	-0.69	0.71	0.71	0.81	1.0	-0.61	-0.55	0.11	-0.39	0.34	
SPX	0.41	0.26	0.73	0.78	0.65	-0.69	-0.22	-0.77	-0.61	1.0	0.86	-0.04	0.74	0.05	
CCMP	0.31	0.19	0.63	0.67	0.49	-0.56	-0.15	-0.64	-0.55	0.86	1.0	0.15	0.61	-0.07	
NKY	-0.18	0.24	-0.23	0.03	0.03	-0.1	0.17	0.04	0.11	-0.04	0.15	1.0	0.11	0.24	
SX5E	0.24	0.35	0.49	0.65	0.61	-0.64	-0.05	-0.71	-0.39	0.74	0.61	0.11	1.0	0.04	
SHCOMP	-0.36	0.51	-0.16	-0.14	-0.21	0.13	0.48	0.11	0.34	0.05	-0.07	0.24	0.04	1.0	

- XAU vs Asia
 - The correlation between XAU and SGD is also interesting as it fluctuates quite a bit between -0.8 and -0.2 and is currently at significant lows, reaching near -1, however, it is returning back to its mean of around -0.5
- Within Asia
 - Among the Asian currencies, SGD and CNH seem to have the strongest correlation of -0.72 and historically have also have had a similar correlation
 - The Z score of the correlation between CNH and INR is currently high, at about 1.7
 - Recently, KRW appears to be strongly correlated with many of the other Asian currencies (correlation of around 0.5-0.7 with INR, IDR, PHP, TWD, THB) – higher than even that with CNH, a large economy

Realised Correlation								
	USDCNH	USDKRW	USDSGD	USDINR	USDIDR	USDPHP	USDTWD	USDTHB
USDCNH	1.0	0.12	0.73	0.5	0.25	-0.03	0.29	0.39
USDKRW	0.12	1.0	0.27	0.3	0.5	0.61	0.65	0.54
USDSGD	0.73	0.27	1.0	0.23	0.03	-0.08	0.06	0.06
USDINR	0.5	0.3	0.23	1.0	0.42	0.33	0.43	0.5
USDIDR	0.25	0.5	0.03	0.42	1.0	0.26	0.6	0.64
USDPHP	-0.03	0.61	-0.08	0.33	0.26	1.0	0.48	0.38
USDTWD	0.29	0.65	0.06	0.43	0.6	0.48	1.0	0.67
USDTHB	0.39	0.54	0.06	0.5	0.64	0.38	0.67	1.0

- G10 vs Asia
 - SGD vs JPY correlation Z score is quite high at around -3.0 and there seems to be large divergence between the realized and implied correlations
 - Most Asian currencies' realized correlation with JPY has a high Z score — possibly linked to JPY crosses trend discussed earlier
 - The realized and implied correlation of EUR and KRW also have a large difference

Reflection: Challenges faced

Building a robust web-based Application (instead of an excel file) and the associated alert system has had its share of challenges and hurdles but has been a great learning experience at the same time

- Understanding and implementing the Bloomberg API for a Python-based web application
- Designing a simple but effective user interface for easy use—including heatmaps with color coding and dynamically changing graphs
- Research on the best way to build an operating system based alert system to schedule the task automatically while figuring out ways of sending the processed data as an email alert
- Using a feasible method to connect the data processing program and display program—passing algorithmic calculations from a Python script to a web browser
- Optimizing the algorithm was essential while working with the possibility of handling more than 30 currencies in one go (around 600 pair combinations)
- End users do not need to have Python installed on their desktop. Hence, some effort was spent on creating a distributable .exe Application file that could run the script seamlessly

- While I have done testing at my end, it still leaves scope for further bug-fixes and improvements.