Quantitative Asset Management Problem Set 3

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Question 1

Data Cleanup
Before getting into the momentum portfolio building, we need to clean up the CRSP data. This data is retrieved out of the CRSP without any constraints. These steps have been followed:

1) Filter out stocks with share code of 10,11 (ordinary common shares with no further definitions)

2) Filter out stocks with exchange code of 1,2,3 (only NYSE, AMEX and NASDAQ)

3) Set all returns as NA when returns are equal to -99, -88, -77, -66, -55, -44, B, C.

4) Set all delisting returns as NA when it is equal to -99, -88, -77, -66, -55, -44, A, P, S, T.

Calculations

1) Before we start calculating, we need to fill in missing months, as it is critical while trying to find the past 12 months returns. By doing this every stock will have an entry for every possible month in the time period we are interested in (in this case, all the entire CRSP period, as we haven't done any trimming).

2) Delist returns need to incorporated into the returns if a company has been delisted. If a delist return is present, it needs to be set as return (if actual return is missing), or combined with the return for that month.

3) The cumulative return needs to be calculated only if the following conditions are satisfied

a) there is a valid price at t-13
b) there is a valid market cap at t-1
c) there is a valid return at t-2
d) there are atleast 8 valid returns in the 11 months period from t-2 to t-12.

4) For the entries which satisfy the above condition, the sum of the log returns are calculated over the t-2 to t-12 period. This is maintained as the ranking return.

Output
1) The required output is trimmed to be from 1927 to 2015.
2) The rows which have ranking return as NA are not removed in this question. (removed in the first step while of next question while calculating the ranks, as we can't rank NA returns.)

Year	Month	PERMNO	EXCHCD	lag_Mkt_Cap	Ret	Ranking_Ret
2015	5	10001	2	105.2516	-0.006951	-0.0449746
2015	6	10001	2	104.8800	0.030000	0.0000683
2015	7	10001	2	108.0779	-0.013107	-0.0159222

Year	Month	PERMNO	EXCHCD	lag_Mkt_Cap	Ret	Ranking_Ret
2015	8	10001	2	105.2448	-0.111665	-0.1911230
2015	9	10001	2	93.5550	0.003367	-0.0748774
2015	10	10001	2	93.8700	0.001678	-0.2430021
2015	11	10001	2	92.6100	-0.009070	-0.2038685
2015	12	10001	2	91.8137	-0.132151	-0.2192270

Question 2

Clean up
Before we calculate the rankings for both types, the rows which have ranking returns as NA needs to be removed. Without doing this, we cannot rank the returns accurately.

Calculations
The main calculation in this question is the ranking using the 2 methods.

Method 1
Based on the Daniel methodology, the sorting into deciles is done using the ranking returns of all the stocks. So the decile breakpoints are calculated using all the stocks available for every month-year combination. Based on which decile the stock's ranking return is in, a rank is given. 1 means the lowest return decile and 10 means the highest return decile.

Method 2
Based on the Kenneth French methodology, the sorting into deciles is done only using ranking returns of NYSE stocks ,i.e, the decile breakpoints are calculated using only the NYSE stocks available fo every month-year combination. All the stocks are now ranked using these breakpoints.

Note that in this case, the number of stocks in each decile might not be the same, as the breakpoints were calculated based on NYSE stocks only.

Output
The output is between 1927 and 2015. Sample output is as follows:

Year	Month	PERMNO	lag_Mkt_Cap	Ret	DM_decile	KRF_decile
2015	12	10001	91.81370	-0.132151	3	3
2015	12	10025	465.29154	-0.153871	10	10
2015	12	10026	2180.28248	0.003257	8	9
2015	12	10028	4.52001	-0.102285	1	1
2015	12	10032	1243.22400	-0.061290	4	4
2015	12	10044	63.99544	-0.019161	4	4

Question 3

Data Apart from the output from the 2nd Question, The fama french data factors needs to be retrieved form the website, in order to get the risk free rate.

Clean up
The fama french data needs to be trimmed to be between 1927 and 2015, which is the same as the output from Question 2.

Calculation
For every year, month, decile combination, calculate the value weighted return of all the stocks. For this, the

lagged market cap and return information needs to be used. This process needs to be done seperately for both the ranking methodology.

After that the we can merge the result with the fama french factors, in order to get the risk free rate for each month-year combination.

Output
As we have already trimmed the inputs to 1927 to 2015, the result of the calculation is the output. A Sample output is as follows:

Year	Month	decile	DM_Ret	KRF_Ret	Rf
2015	12	1	-0.0448317	-0.0429623	1e-04
2015	12	2	-0.0248609	-0.0663709	1e-04
2015	12	3	-0.0795967	-0.0568504	1e-04
2015	12	4	-0.0282196	-0.0200143	1e-04
2015	12	5	-0.0229169	-0.0255878	1e-04

Question 4

Data
The question asks us to follow the methodology and format of the paper. The table in the paper trims the return data from January 1927 to March 2013. This has been performed on the data. All the calculations will be done only for the Daniel-Moskowitz value weighted returns.

Calculations
1) Mean is calculated for the returns of every year, month and decile combination and the result is annualized arithmetically (multiply by 12)
2) Standard deviation is calculated for the returns of every year, month and decile combination and the result is annualized arithmetrically (multiply by $\sqrt{}(12)$)
3) Sharpe Ratio is also shown in annualized terms.
4) Skewness for the deciles is calculated for the log returns (not excess) of every year, month and decile combination. For the WML, it is the realized skewness of $\log(1+r_{WML}+r_f)$

	Dec1	Dec2	Dec3	Dec4	Dec5
Mean Excess Return	-2.80	2.60	3.10	6.40	7.20
Std	36.60	30.60	25.90	23.10	21.50
Sharpe Ratio	-0.08	0.08	0.12	0.28	0.34
Skewness	0.08	-0.09	-0.17	0.14	-0.08

	Dec6	Dec7	Dec8	Dec9	Dec10	WML
Mean Excess Return	7.20	9.10	10.40	11.40	15.60	18.30
Std	20.30	19.40	19.10	20.40	23.80	30.00
Sharpe Ratio	0.35	0.47	0.54	0.56	0.65	0.61
Skewness	-0.23	-0.56	-0.54	-0.76	-0.80	-5.12

Question 5

Data

To perform the correlation between our KRF and DM returns and their original values, we get the KRF and DM data from the corresponding websites. The data is available until 2017 in KRF website and until 2016 in the DM website. For DM, the m _ m _ pt _ tot .txt was used as that indicates the file with the total returns for all firms on a monthly basis.

The data needs to be formatted to fit the input constraints for this problem (group all deciles together and place them column wise). The data in all data sets needs to be trimmed from 1927 to 2015 as mentioned in the question.

Calculations
Calculate correlation between the calculated DM/KRF returns and corresponding DM/KRF returns from the website. This is done for every decile portfolio and the WML portfolio.

It is not clearly mentioned whether we need to take correlation with excess returns or normal returns for both the KRF and DM data. I have assumed that normal returns are used for correlation calculation.

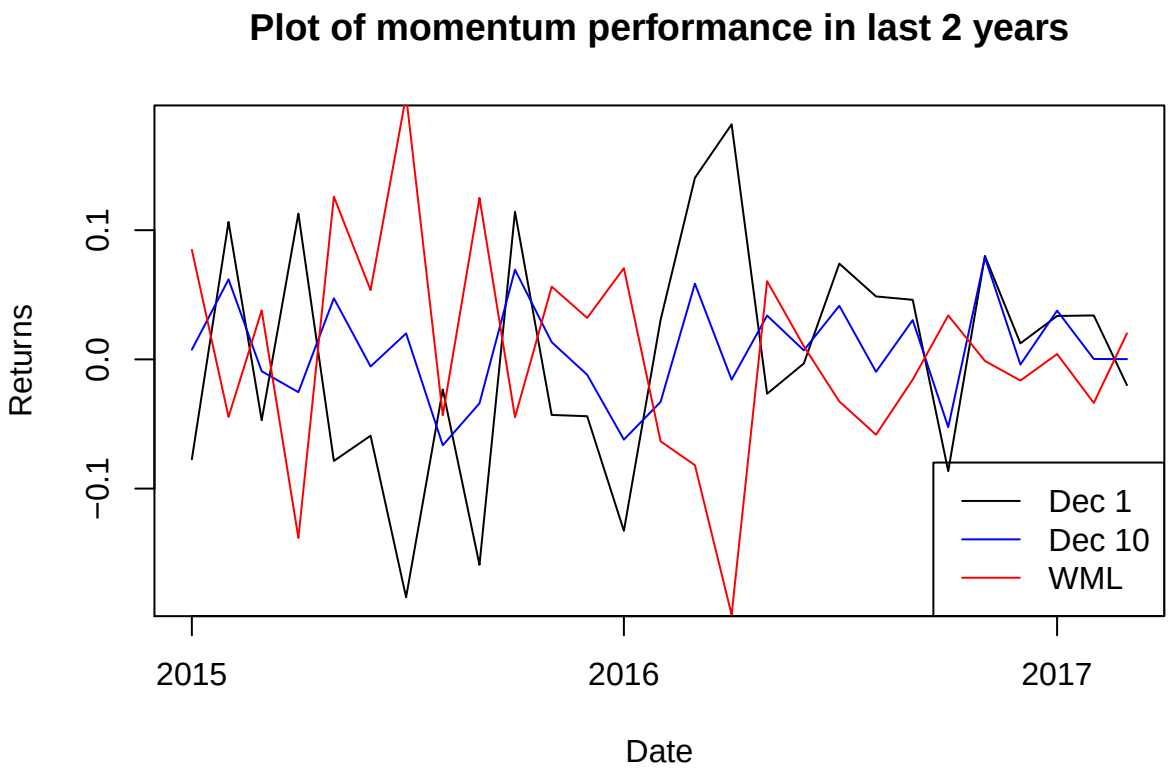
Output
The correlations are as follows:

	Dec1	Dec2	Dec3	Dec4	Dec5
DM Correlation	0.9981	0.9983	0.9984	0.9981	0.9982
KRF Correlation	0.9979	0.9985	0.9981	0.9979	0.9977

	Dec6	Dec7	Dec8	Dec9	Dec10	WML
DM Correlation	0.9985	0.9986	0.9991	0.9989	0.9986	0.9963
KRF Correlation	0.9976	0.9976	0.9988	0.9985	0.9990	0.9960

Question 6

Based on the KRF data on the website (contains data until current month), we can see that the momentum portfolio hasn't been doing well recently. This might be because of the sluggish economy, which keeps the returns on the momentum strategy low.



Question 7

In normal environments, the momentum factor is both statistically and economically strong. But during panic states, immediately after multi-year market drawdowns, momentum as a standalone strategy, can be very risky and can lead to huge losses. The volatility of momentum strategy is quite high compared to the market. Another challenge which makes it tough to invest in momentum is the time varying beta, especially for the loser portfolio.

At the moment, all the macro-economic factors are positive in the market. This means that there is a possibility of a upward trending market in the near future. So, I will invest in the momentum strategy.