

# Yushi Wei - Sample Work Description

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*Construct the value-weighted market return using CRSP data, replicating the market return time series available in Kenneth French website. Also calculate the equal-weighted market return, and the lagged total market capitalization. Your output should be from January 1926 to December 2019, at a monthly frequency.*

Prior to any calculations, I clean the data as per the Ken French procedure listed on their website. Variables are defined as such:

- *SHRCD* = Share Code
- *EXCHCD* = Exchange Code (1 = NYSE, 2 = AMEX, 3 = NASDAQ)
- *DLRET* = Delisting Return in decimal
- *SHROUT* = Number of publicly held shares in thousands

1. Universe of stocks: Following Ken French procedure, the sample is filtered to show only the common shares (share codes 10 and 11) as well as to securities traded only on the NYSE, ASE, and NASDAQ (exchange codes 1,2,3, respectively)

2. Missing returns: The cumulative dividend total return (thereafter referred to as return) is calculated with the follow equation where h is holding period return and d is delisting return. In the holding period returns (HRET), there is no zero. There are zeros, however, in the DLRET. Therefore, the zeros in the cumulative dividend returns is equivalent to having NA's in both HRET and DLRET.

$$r_{i,t} = \begin{cases} r_{i,t}^h & \text{if } r_{i,t}^d \text{ missing} \\ r_{i,t}^d & \text{if } r_{i,t}^h \text{ missing} \\ (1 + r_{i,t}^h)(1 + r_{i,t}^d) - 1 & \text{if both not missing} \end{cases}$$

3. Delisting return calculation: value is provided in percentage, divide by 100 to convert to decimal and is subsequently converted to numeric type. All NAs are replaced with 1's to calculate the cumulative dividend return.

4. Market Capitalization calculation: For the negative price per share, the negative signs is an indication of the bid/ask average for a trading month range when the closing price is not available. Compare to the full dataset's return median of 0% and mean of 0.0111%, the return median is 0% and the mean is 0.0096% for negative price per share. Therefore, it is suitable to be included in the analysis. The market capitalization is calculated by multiplying the shares outstanding (SHROUT) by the price per share (PRC) and divided by 1000 to obtain this in millions. This is further filtered for market caps greater than zero.

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5. (Definition) Portfolio weights: For the equal-weighted portfolio, the average of the returns at a certain date is taken. Whereas for the value-weighted returns are calculated using the equations below. I first took the first lag of the individual securities market cap (by PERMNO key) and the total market cap on that particular day (by date key). I then divided the lagged individual securities market cap by the total market cap to obtain the weight at t-1 for a particular time t.

► Market Portfolio weights:

$$w_{i,t}^{mkt} = \frac{me_{i,t-1}}{\sum_i me_{i,t-1}}$$

► Market Portfolio

$$R^{mkt}_t = \sum_i w_{i,t}^{mkt} r_{i,t} = \sum_i \frac{me_{i,t-1}}{\sum_j me_{j,t-1}} r_{i,t}$$

6. Sample period: Lagged one-period of the respective stock is used at each date. This resulted in NA's, which will be omitted in the calculation of value-weighted returns.

7. Missing Closing Price: As per CRPS, the price at close reflects either closing price or bid/ask average. If none of them are available, PRC is set to zero. In this case, I chose to omit the data. By filtering out the NA's in PRC, this also implicitly filters out the NAs in MKTCAP as well.