

### 3rd set SAS assignments

Data description for the three data sets `rwetrad` (RWE), `tuitrad` (TUI) and `sietrad` (SIEMENS):

Variable	Label	Explanation
<code>event_d</code>	Date of Trading	self explanatory
<code>event_t</code>	Time of Trading	self explanatory
<code>event_dt</code>	Date and Time of Transaction	self explanatory
<code>vol</code>	Number Securities Traded	self explanatory
<code>price</code>	Security Price DM	Transaction price in Euro
<code>bidprice</code>	Last recorded Bid Price	Prevailing bid price prior to the trade
<code>askprice</code>	Last recorded Ask Price	Prevailing ask price prior to the trade
<code>in_class</code>	Buy/Sell Indicator (Quote)	Indicator variable taking the value 1 if trade was a buy and -1 if trade was a sell
<code>midpoint5</code>	Last recorded BA Midpoint 5 minutes after the trade	Prevailing Bid/Ask midpoint 5 minutes after the trade

#### 1. Working with ultra high frequency data

- i) Choose one data set and compute the Bid/Ask midpoint as  $(bidprice + askprice)/2$ , the effective spread  $ES$ , the realized spread  $RS$  and the price impact  $PI$  where

$$ES = \begin{cases} 2 \cdot (price - midpoint) & \text{if buy} \\ 2 \cdot (midpoint - price) & \text{if sell} \end{cases}$$
$$RS = \begin{cases} 2 \cdot (price - midpoint5) & \text{if buy} \\ 2 \cdot (midpoint5 - price) & \text{if sell} \end{cases}$$
$$PI = (ES - RS)/2$$

Provide informative labels for the newly created variables.

- ii) Include the macro file `macros.sas` and call the macro `xtenmin` in a data step. Try to figure out what the macro actually does.

- iii) Calculate means together with 90% confidence bands for the variables ES, RS and PI for each ten minute interval of the trading day across all trading days (Use PROC MEANS). Write the means to a new data set and create a variable with the stock ID in this data set.
- iv) Plot the means and the confidence bands for each ten minute interval against time of day in an appealing manner.