

# CUSUM Pseudocode

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*****
SKEWNESS:
    A function that finds the CUSUM chart values for a numeric vector
    x.

Calls:
    MAX

Called by:
    parameter_finder, evaluate_CUSUM_results

Input Parameters:
    x - a numerical vector
    xBar - the mean of the in-statistical-control process
    sigma - the standard deviation of the in-statistical-control
            process
    H - the decision interval; a numeric value specifying the number
        of standard errors of the summary statistics at which the
        cumulative sum is out of control.
    k - the amount of shift to be determined in the process, measured
        in standard errors.

Returns:
    low_sums - a vector of the lower cumulative sums
    hi_sums - a vector of the upper cumulative sums
    upper_viol_index - index of the points for which the corresponding
                      sum violates the upper bound
    lower_viol_index - index of the points for which the corresponding
                      sum violates the lower bound
*****
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FUNCTION    CUSUM(x, xBar, sigma, H, k)

    INIT z <-NULL
    INIT z_pos<- NULL
    INIT z_neg <- NULL
    INIT low_sum<- NULL
    INIT hi_sum<- NULL
    INIT upper_viol_index <- NULL
    INIT lower_viol_index <- NULL
    n <- LEN(x)
    ldb <- - H
    udb <- H

    FOR i FROM 1 TO n
        z[i] <- (x[i] - x_bar)/sigma
        z_pos[i] <- z[i] - k/2
        z_neg[i] <- z[i] + k/2
        low_sum[i] <- NA
        hi_sum[i] <- NA
    ENDFOR

    hi_sum[1] <- MAX{0, z_pos[1]}
    low_sum[1] <- MAX{0, -z_neg[1]}

    FOR i FROM 2 TO n
        hi_sum <- MAX{0, hi_sum[i-1] + z_pos[i]}
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        low_sum <- MAX{0, low_sum[i-1] - z_neg[i]}
    ENDFOR

    FOR i FROM 1 TO n
        low_sum[i] <- -low_sum[i]
    ENDFOR

    FOR i FROM 1 TO n
        IF low_sum[i] < ldb THEN
            lower_viol_index <- APPEND(lower_viol_index, i)
        ENDIF
        IF hi_sum[i] > udb THEN
            upper_viol_index <- APPEND(upper_viol_index, i)
        ENDIF
    ENDFOR

    RETURN(low_sums, hi_sums, upper_viol_index, lower_viol_index)

ENDFUNCTION

```