Linear Forced Through Zero
Definition

A calibration curve defined using this equation is forced to go through zero intensity and zero concentration. This calibration is established by assuming that the relationship between concentration and intensity is linear.

Ref: WinLab32 Help copyright © 1999 - 2004 by PerkinElmer, Inc. All rights reserved.
Linear Forced Through Zero

It is often tempting to exclude the intercept, $a$, from the model because a zero stimulus on the $x$-axis should lead to a zero response on the $y$-axis. However, the correct procedure is to fit the full model and test for the significance of the intercept term.

http://www.itl.nist.gov/div898/handbook/mpc/section3/ mpc361.htm  Section 2.3.6.1
Linear Forced Through Zero

- Do not include the origin \((0,0)\) as an extra calibration point.

- Forcing the curve through zero is not the same as including the origin as a fictitious point in the calibration.

- If the curve is forced through zero, the intercept is set to 0 before the regression is calculated, thereby setting the bias to favor the low end of the calibration range by “pivoting” the function around the origin to find the best fit and resulting in one less degree of freedom.

Ref: SW-846, Method 8000C, Section 11.5.2.1
Linear Forced Through Zero

- Do not include the origin \((0,0)\) as an extra calibration point.

- Forcing the curve through zero is not the same as including the origin as a fictitious point in the calibration.

- If the curve is forced through zero, the intercept is set to 0 before the regression is calculated, thereby setting the bias to favor the low end of the calibration range by “pivoting” the function around the origin to find the best fit and resulting in one less degree of freedom.

Ref: SW-846, Method 8000C, Section 11.5.2.1
Linear Forced Through Zero

- Do not include the origin (0,0) as an extra calibration point.

- Forcing the curve through zero is not the same as including the origin as a fictitious point in the calibration.

- If the curve is forced through zero, the intercept is set to 0 before the regression is calculated, thereby setting the bias to favor the low end of the calibration range by “pivoting” the function around the origin to find the best fit and resulting in one less degree of freedom.

Ref: SW-846, Method 8000C, Section 11.5.2.1
Linear Forced Through Zero

• It may be appropriate to force the regression through zero for some calibrations.

• However, the use of a linear regression or forcing the regression through zero may NOT be used as a rationale for reporting results below the calibration range demonstrated by the analysis of the standards.

• If it is necessary to report results at lower concentrations, then the analyst should run a calibration that reaches those lower concentrations.

Ref: SW-846, Method 8000C, Section 11.5.2.1
Linear Forced Through Zero

• It may be appropriate to force the regression though zero for some calibrations.

• However, the use of a linear regression or forcing the regression through zero may NOT be used as a rationale for reporting results below the calibration range demonstrated by the analysis of the standards.

• If it is necessary to report results at lower concentrations, then the analyst should run a calibration that reaches those lower concentrations.

Ref: SW-846, Method 8000C, Section 11.5.2.1
Linear Forced Through Zero

• It may be appropriate to force the regression though zero for some calibrations.

• However, the use of a linear regression or forcing the regression through zero may NOT be used as a rationale for reporting results below the calibration range demonstrated by the analysis of the standards.

• If it is necessary to report results at lower concentrations, then the analyst should run a calibration that reaches those lower concentrations.

Ref: SW-846, Method 8000C, Section 11.5.2.1
Linear Regression Equations Forced Through Zero

Calculations for a linear least square regression that is forced through zero are performed using the equations as described for a linear least square regression. To determine the slope and intercept for a curve forced through zero all concentration and response values are entered as determined and the negative integers of these concentrations and responses are also entered for each level.
Benefits

Simple; calibration can be represented by $y = mx$.

Is correct when the origin (zero, zero) is within the error of the measurement.

Disadvantages

Not best fit to data unless slope is the same at all points.

Incorrect when points have responses offset from zero (e.g., high blank).

EnviroQuant Flaw With the $r^2$ Determination of Linear (0,0)