



Morningstar Category Buffering Rules

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Introduction

Diversified U.S. equity funds and diversified foreign equity funds are categorized based on the three-year average of the fund's Style Box coordinates (Raw X Value-Growth Score, Raw Y Size Score).

Additionally, to ensure that a fund is re-categorized only when a material and sustained change in its characteristics has occurred, a buffer zone—into which the fund's three year average centroid can move without triggering immediate re-categorization—is created for each fund, based on a quantitative formula and the following principles:

- ▶ Ordinary temporal variation in fund characteristics makes a fund whose three-year average centroid lies near a breakpoint more likely to "cross the line" in a subsequent period than is a fund whose average centroid lies near the center of a style box. A larger buffer is therefore allowed for funds with centroids lying just inside a breakpoint.
- ▶ A fund whose three-year average centroid has been slightly inconsistent with its category over several re-categorization dates may be re-categorized, whereas a fund whose average centroid has crossed the breakpoint by a larger amount, but only for a short period of time, may not.
- ▶ If the current category assignment agrees with the current Style Box location, the fund's category is not changed even if the three-year average centroid falls within a different category zone.

For a given fund there are up to four buffer zones (above and/or below the fund's average centroid location on each of the size and style axes of the fund grid). The buffer zone locations are fund-specific, and are calculated as described below.

In this document . . .

- ▶ "Large-cap" or "LC" can refer to U.S. or foreign funds (categories LV, LB, LG, Foreign Large Value, Foreign Large Blend, or Foreign Large Growth)
- ▶ "Small/mid" only refers to foreign funds (categories Foreign Small/Mid Value or Foreign Small/Mid Growth)
- ▶ "Mid-cap" or "MC" only refers to U.S. funds (categories MV, MB, MG)
- ▶ "Small-cap" or "SC" only refers to U.S. funds (categories SV, SB, SG)

Size Buffer Calculations

Let

- $P(\text{YScore})_{.1}$ = the fund's three year average raw Y Score from the last evaluation period
- $P(\text{YScore})_{.2}$ = the fund's three year average raw Y Score from the evaluation period two periods ago
- MBP = minimum proportion of default size buffer allowed for any fund (currently 0.2)
- DYB_s = default size buffer for funds of size s (currently 5 for LC, 10 for mid-cap, small-cap, or small/mid-cap (foreign))
- DY_s = assumed average size score for funds of size s (currently 250 for LC funds, 150 for MC funds, 50 for SC funds, and 150 for small/mid-cap funds)
- YBA_s = size buffer adjustor for funds of size s (currently 125 for all fund sizes)
- LYB = current low size buffer for large- or mid-cap funds
- HYB = current high size buffer for mid- or small-cap funds or small/mid-cap funds
- YB_l = applicable current low breakpoint (100 for MC funds, 200 for LC funds)
- YB_h = applicable current high breakpoint (100 for SC funds, 200 for MC funds, 200 for small/mid-cap funds)
- py_L or py_H = number of historical values of P(YScore) available and/or used (use a maximum of 2 now, although this variable may change in the future) that were in the low (high) buffer zone. We count these starting from time -1, and count backwards through time until we encounter a value of P(YScore) that is not in the buffer zone or until we run out of observations.
- $YBMAX_s$ = maximum size buffer allowed for any fund of size s (7 for large cap, 14 for mid-cap, small-cap, or mid/small-cap)

$$YBMAX_s = DYB_s + [(200 - 100)/(2 \bullet YBA_s)] \bullet DYB_s$$

Low Size Buffer for Large- & Mid-cap Funds

Where $P(\text{YScore})_{-1}$ was not in a low buffer zone

i.e. where $P(\text{YScore})_{-1} > = YB_l$ for mid-cap funds and $P(\text{YScore})_{-1} > YB_l$ for large-cap funds.

$$\text{LYB} = \max \left[\text{MBP} \bullet \text{DYB}_s, \text{DYB}_s + \frac{(\text{DY}_s - P(\text{YScore})_{-1}) \bullet \text{DYB}_s}{\text{YBA}_s} \right]$$

Where $P(\text{YScore})_{-1}$ was in a low buffer zone

i.e. where $P(\text{YScore})_{-1} < YB_l$ for mid-cap funds and $P(\text{YScore})_{-1} < = YB_l$ for large-cap funds.

$$\text{LYB} = \max \left[0, \sum_{t=-\text{py}_L}^{-1} P(\text{YScore})_t - \text{py}_L * YB_l + \text{YBMAX}_s \right]$$

Where $P(\text{YScore})_{-1}$ is null and current category is $\{LV, LB, LG, FV, FB, FG, MV, MB, MG\}$

$$\text{LYB} = \text{DYB}_s$$

Where current category is not $\{LV, LB, LG, FV, FB, FG, MV, MB, MG\}$

$$\text{LYB} = 0$$

High Size Buffer for Mid-cap, Small-cap, and Small/mid-cap Funds

Where $P(\text{YScore})_{-1}$ was not in a high buffer zone

i.e. where $P(\text{YScore})_{-1} < = YB_h$ for mid-cap funds and small/mid-cap funds and $P(\text{YScore})_{-1} < YB_h$ for small-cap funds.

$$\text{HYB} = \max \left[\text{MBP} \bullet \text{DYB}_s, \text{DYB}_s + \frac{(P(\text{YScore})_{-1} - \text{DY}_s) \bullet \text{DYB}_s}{\text{YBA}_s} \right]$$

Where $P(\text{YScore})_{-1}$ was in a high buffer zone

i.e. where $P(\text{YScore})_{-1} > YB_h$ for mid-cap funds and small/mid-cap funds and $P(\text{YScore})_{-1} > = YB_h$ for small-cap funds.

$$\text{HYB}_f = \max \left[0, \text{py}_H * YB_h - \sum_{t=-\text{py}_H}^{-1} P(\text{YScore})_t + \text{YBMAX}_s \right]$$

Where $P(\text{YScore})_{-1}$ is null and current category is $\{MV, MB, MG, FA, FR, SV, SB, \text{ or } SG\}$

$$\text{HYB} = \text{DYB}_s$$

Where current category is not $\{MV, MB, MG, FA, FR, SV, SB, \text{ or } SG\}$

$$\text{HYB} = 0$$

Style Buffer Calculations

Let

$P(\text{XScore})_{.1}$ = The fund's three year average raw X Score from the last evaluation period

$P(\text{XScore})_{.2}$ = The fund's three year average raw X Score from the evaluation period two periods ago

MBP = minimum proportion of average style buffer allowed for any fund (currently 0.2)

DXB_s = default style buffer for funds of size s (currently 5 for LC, 7 for mid-cap, small-cap, or small/mid-cap)

DX = assumed average style score for funds of any size (currently 200 for foreign small/mid growth, 225 for all other growth funds, 150 for all blend funds, 100 for foreign small/mid value funds, and 75 for all other value funds)

XBA_s = style buffer adjustor for funds of size s (currently 125 for LC and 75 for mid-cap, small-cap, or small/mid-cap)

LXB = current low style buffer for growth or blend funds

HXB = current high style buffer for value or blend funds

XB_l = applicable current low breakpoint (125 for blend funds, 150 for foreign small/mid growth funds, and 175 for all other growth funds)

XB_h = applicable current high breakpoint (150 for foreign small/mid value funds, 125 for all other value funds, and 175 for blend funds)

p_{x_l} or p_{x_h} = number of historical values of $P(\text{XScore})$ available and/or used (use a maximum of 2 now, although this variable may change in the future) that were in the low (high) buffer zone. We count these starting from time -1 , and count backwards through time until we encounter a value of $P(\text{XScore})$ that is not in the buffer zone or until we run out of observations.

XBMAX_s = maximum style buffer allowed for any fund of size s (7 for large-cap, 11.67 for mid/small cap)

$$\text{XBMAX}_s = \text{DXB}_s + [(225 - 175) / \text{XBA}_s] \cdot \text{DXB}_s$$

Low Style Buffer for Growth or Blend funds

Where $P(XScore)_{-1}$ was not in low buffer zone

i.e. where $P(XScore)_{-1} > = XB_l$ for blend funds, $P(XScore)_{-1} > = XB_l$ for foreign small/mid growth funds and $P(XScore)_{-1} > XB_l$ for growth funds.

$$LXB = \max \left[MBP \bullet DXB_s, DXB_s + \frac{(DX - P(XScore)_{-1}) \bullet DXB_s}{XBA_s} \right]$$

Where $P(XScore)_{-1}$ was in low buffer zone

i.e. where $P(XScore)_{-1} < XB_l$ for blend funds, $P(XScore)_{-1} < XB_l$ for foreign small/mid growth funds, and $P(XScore)_{-1} < = XB_l$ for growth funds.

$$LXB = \max \left[0, \sum_{t=-px_L}^{-1} P(XScore)_t - px_L * XB_l + XBMAX_s \right]$$

Where $P(XScore)_{-1}$ is null and current category is {LB, LG, FB, FG, FR, MB, MG, SB, or SG}

$$LXB = DXB_s$$

Where current category is not {LB, LG, FB, FG, FR, MB, MG, SB, or SG}

$$LXB = 0$$

High Style Buffer for Blend or Value funds

Where $P(XScore)_{-1}$ was not in high buffer zone

i.e. where $P(XScore)_{-1} < = XB_h$ for blend funds, $P(XScore)_{-1} < = XB_h$ for foreign small/mid value funds, and $P(XScore)_{-1} < XB_h$ for value funds.

$$HXB = \max \left[MBP \bullet DXB_s, DXB_s + \frac{(P(XScore)_{-1} - DX) \bullet DXB_s}{XBA_s} \right]$$

Where $P(XScore)_{-1}$ was in high buffer zone

i.e. where $P(XScore)_{-1} > XB_h$ for blend funds, $P(XScore)_{-1} > XB_h$ for foreign small/mid value funds, and $P(XScore)_{-1} > = XB_h$ for value funds.

$$HXB = \max \left[0, px_H * XB_h - \sum_{t=-px_H}^{-1} P(Score)_t + XBMAX_s \right]$$

Where $P(XScore)_{-1}$ is null and current category is {LV, LB, FV, FB, FA, MV, MB, SV, SB }

$$HXB = DXB_s$$

Where current category is not {LV, LB, FV, FB, FA, MV, MB, SV, SB }

$$HXB = 0$$

Categorizing Funds

Step 1: Determine Buffered Size, Style, and Category

Buffered Size if the fund is currently in one of the Foreign Small/Mid-cap categories:

It moves to Large-Cap if $P(\text{Yscore}) > 200 + \text{HYB}$

It remains Small/Mid-Cap if $P(\text{Yscore}) \leq 200 + \text{HYB}$

Buffered Style if the fund is currently in one of the Foreign Small/Mid-cap categories:

If the fund is currently in the Foreign Small/Mid Value category,

It remains Value if $P(\text{Xscore}) < 150 + \text{HXB}$

It moves to Growth if $P(\text{Xscore}) \geq 150 + \text{HXB}$

If the fund is currently in the Foreign Small/Mid Growth category,

It remains Growth if $P(\text{Xscore}) \geq 150 - \text{LXB}$

It moves to Value if $P(\text{Xscore}) < 150 - \text{LXB}$

Buffered Size for all other funds:

If the fund is currently in one of the Large-cap categories,

It remains Large-cap if $P(\text{YScore}) > 200 - \text{LYB}$

It moves to Mid-cap if $100 \leq P(\text{YScore}) \leq 200 - \text{LYB}$

It moves to Small-cap if $P(\text{YScore}) < 100$

If the fund is currently in one of the Mid-cap categories,

It moves to Large-cap if $P(\text{YScore}) > 200 + \text{HYB}$

It remains Mid-cap if $100 - \text{LYB} \leq P(\text{YScore}) \leq 200 + \text{HYB}$

It moves to Small-cap if $P(\text{YScore}) < 100 - \text{LYB}$

If the fund is currently in one of the Small-cap categories,

It moves to Large-cap if $P(\text{YScore}) > 200$

It moves to Mid-cap if $100 + \text{HYB} \leq P(\text{YScore}) \leq 200$

It remains Small-cap if $P(\text{YScore}) < 100 + \text{HYB}$

Buffered Style for all other funds:

If the fund is currently in one of the Value categories,
It remains Value if $P(\text{XScore}) < 125 + \text{HXB}$
It moves to Blend if $125 + \text{HXB} \leq P(\text{XScore}) \leq 175$
It moves to Growth if $P(\text{XScore}) > 175$

If the fund is currently in one of the Blend categories,
It moves to Value if $P(\text{XScore}) < 125 - \text{LXB}$
It remains Blend if $125 - \text{LXB} \leq P(\text{XScore}) \leq 175 + \text{HXB}$
It moves to Growth if $P(\text{XScore}) > 175 + \text{HXB}$

If the fund is currently in one of the Growth categories,
It moves to Value if $P(\text{XScore}) < 125$
It moves to Blend if $125 \leq P(\text{XScore}) \leq 175 - \text{LXB}$
It remains Growth if $P(\text{XScore}) > 175 - \text{LXB}$

Buffered Category = Buffered Size + Buffered Style

Step 2: Determine Final Category Recommendation

If current Style Box value = current category, then Final Category = current category.

(For Foreign Small/Mid Value funds, if current Style Box = SV, SB, MV, MB, then Final Category = current category.)

For Foreign Small/Mid Growth funds, if current Style Box = SB, SG, MB, MG, then Final Category = current category.)

Else, Final Category = Buffered Category