Derivation of the Swing Factor Formula

In the intuitive example in the last post, we calculated the swing price by dividing the amount of net redemptions to be paid ($5 million) by the number of shares to be redeemed (5,001,000).

$$Swing\ Price = \frac{Net\ Redemptions}{Net\ Shares\ Redeemed}$$

The number of net shares redeemed equaled (i) the shares redeemed at the current net asset value per share ("NAV") to pay for the net redemptions plus (ii) the shares redeemed at the NAV to pay for the estimated costs of selling a vertical slice of the portfolio with a market value equal to the net redemptions. Thus:

$$Swing\ Price = \frac{Net\ Redemptions}{\left(^{Net\ Redemptions}/_{NAV}\right) + \left(^{Costs}/_{NAV}\right)}$$

This simplifies to:

$$Swing\ Price = \left(\frac{Net\ Redemptions}{Net\ Redemptions + Costs}\right) \times NAV$$

In our example, $5 million divided by 5,001,000 times an NAV of $1.000 equaled a swing price of $0.99980004. The equation makes sense because the swing price must be less than the NAV, and dividing the net redemptions by the net redemptions plus costs produces a percentage less than one.

However, the proposed amendments require a swing price equal to the NAV adjusted by a "swing factor." The swing factor is a percentage of the NAV. Expressed mathematically:

$$NAV\ \times (1 - Swing\ Factor) = Swing\ Price$$

We can set the two equations for the swing price equal to one another, so that:

$$NAV\ \times (1 - Swing\ Factor) = \left(\frac{Net\ Redemptions}{Net\ Redemptions + Costs}\right) \times NAV$$

Dividing through by the NAV reduces the terms to:

$$\cancel{NAV}\ \times (1 - Swing\ Factor) = \left(\frac{Net\ Redemptions}{Net\ Redemptions + Costs}\right) \times \cancel{NAV}$$

$$1 - Swing\ Factor = \frac{Net\ Redemptions}{Net\ Redemptions + Costs}$$

Subtracting 1 from each side results in:

$$-Swing\ Factor = \left(\frac{Net\ Redemptions}{Net\ Redemptions + Costs}\right) - 1$$

We can use a common denominator to simplify the right side of the equation.

$$-Swing\ Factor = \left(\frac{Net\ Redemptions}{Net\ Redemptions + Costs}\right) - \left(\frac{Net\ Redemptions + Costs}{Net\ Redemptions + Costs}\right)$$

$$-Swing\ Factor = \frac{\cancel{Net\ Redemptions} - \cancel{Net\ Redemptions} - Costs}{Net\ Redemptions + Costs}$$

Finally, dividing by negative 1 removes the negative sign to yield:

$$Swing\ Factor = \frac{Costs}{Net\ Redemptions + Costs}$$

This is the swing factor formula.

We can apply this formula to the Treasury Note example in the post to confirm the SEC's claim that

> adjusting the NAV by the spread costs of redemptions is economically equivalent to striking the NAV at the bid price.

Assume that a fund with 30 million shares outstanding held the $30 million face amount Treasury Note as its only asset. If the note is valued at the mid price, the fund's NAV would be **$1.01072**; at the bid price the NAV would be **$1.01070**. If one percent of the shares (300,000 shares) were redeemed, the redemption amount at the mid price NAV would be $300,213.86, which is the same as the value of the note sold in the example provided in the post. If the spread cost is $5.94, then the swing factor would be:

$$Swing\ Factor = {}^{\$5.94}/_{(\$300{,}213.86 + 5.94)} = {}^{\$5.94}/_{\$303{,}219.80} = 0.001979\%$$

Adjusting the NAV by this swing factor produces a swing price of:

$$Swing\ Price = \$1.01072 \times (1 - 0.001979\%) = \$1.01072 \times 99.998021\% = \$1.0170$$

which is the same as the NAV calculated at the bid price.

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