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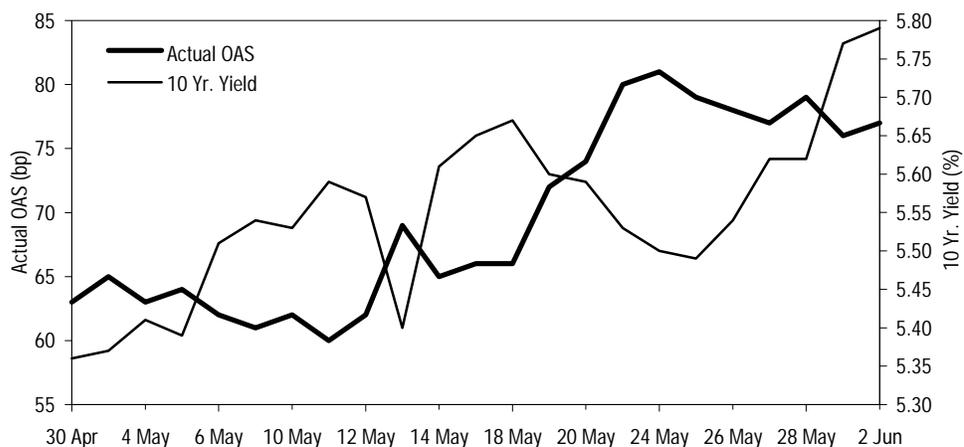
Similar to Empirical Durations, OAS Correlations Can Also Mislead

As discussed in our May 21, 1999, *Bond Market Roundup: Strategy*, empirical durations measured using daily changes can be misleading when comparing them to actual price-level changes, which occur over longer periods of time. For example, for the close of June 2, 1999, the price change of conventional 30-year 6.5s over the previous month was 2–14, while the ten-year Treasury Yield was up 43.5bp. These cumulative changes imply a duration of about 5.8 ($2-14/(97*0.435)$). However, the empirical duration for the period was 3.1.

There is a disconnect between cumulative changes and correlations of daily changes.

A similar disconnect between daily changes and cumulative changes exists for OAS/ten-year yield correlations. (When OASs tend to widen in a rally, the correlation would be negative with a correlation of -100%, indicating complete negative correlation.) For example, for the close of June 2, 1999, the OAS of conventional 6.5s had increased 14bp during the past month, while the ten-year yield was up 43.5bp, as shown in Figure 28. The fact that both increased suggests that the two data series were positively “correlated.” But the calculated correlation between daily *changes* of OAS and daily *changes* in the ten-year was -87%. What causes the difference between intuition and the computed value of correlation?

Figure 28. Conventional 6.5s OAS and Ten-Year Treasury Yield



Source: Salomon Smith Barney.

What Correlation of Changes Measures

Correlation of daily changes of OAS and daily changes in the ten-year is a measure of to what degree increases in the ten-year are accompanied by a coincidental increase in OAS (an increase in OAS corresponds to a positive correlation value, while a decrease would correspond to negative correlation). The Change columns in Figure 29 (the fourth and fifth columns) show a tendency for positive ten-year changes to be paired with negative OAS changes and vice versa. This pattern leads to the computed -87% correlation of changes. However, although the daily changes tended to have opposite signs, both the OAS and the ten-year themselves (as opposed to changes in their quantities) display an overall cumulative increasing trend during the month, as seen in Figure 28.

What Correlation of Changes Does Not Measure

The underlying trend does not really affect the calculation of correlation of changes. This can be seen in Figure 29, which shows a fake OAS series (sixth column) derived from the real one (second column). The fake OAS series is obtained by subtracting 2bp from each actual OAS change. This fixed difference of 2bp between the two OAS change columns results in the fake OAS series accumulating a -2bp differential for each period. So, for example, the final fake OAS for June 2 is 44bp lower than the actual OAS, since there are a total of 22 daily changes over which the -2bp is accumulated.

Figure 29. Conventional 6.5s OAS, Ten-Year Treasury Yield, and Daily Changes

DATE	Actual OAS	10-YR Yield	OAS Change	TSY Change	Fake OAS	10-YR Yield	OAS Change	TSY Change
30 Apr	63 bp	5.36 %	- bp	- bp	63 bp	5.36 %	— bp	— bp
3 May	65	5.37	2	1	63	5.37	0	1
4 May	63	5.41	-2	4	59	5.41	-4	4
5 May	64	5.39	1	-2	58	5.39	-1	-2
6 May	62	5.51	-2	11	54	5.51	-4	11
7 May	61	5.54	-1	3	51	5.54	-3	3
10 May	62	5.53	1	-1	50	5.53	-1	-1
11 May	60	5.59	-2	6	46	5.59	-4	6
12 May	62	5.57	2	-2	46	5.57	0	-2
13 May	69	5.4	7	-17	51	5.4	5	-17
14 May	65	5.61	-4	21	45	5.61	-6	21
17 May	66	5.65	1	4	44	5.65	-1	4
18 May	66	5.67	0	2	42	5.67	-2	2
19 May	72	5.6	6	-7	46	5.6	4	-7
20 May	74	5.59	2	-1	46	5.59	0	-1
21 May	80	5.53	6	-6	50	5.53	4	-6
24 May	81	5.5	1	-3	49	5.5	-1	-3
25 May	79	5.49	-2	-1	45	5.49	-4	-1
26 May	78	5.54	-1	5	42	5.54	-3	5
27 May	77	5.62	-1	8	39	5.62	-3	8
28 May	79	5.62	2	0	39	5.62	0	0
1 Jun	76	5.77	-3	15	34	5.77	-5	15
2 Jun	77	5.79	1	2	33	5.79	-1	2

Source: Salomon Smith Barney.

The fake OAS series displays cumulative behavior (the OAS tightens) opposite to that of the actual OAS series (which widens). But the correlation of *changes* of each versus changes in the ten-year are identical (-87%). *The effect of an underlying trend is not captured by the correlation of daily changes. So there is no real relation between correlation of changes and cumulative changes in OAS and the ten-year.*⁵

How This Relates to Durations

If empirical durations are measured by regressing daily changes, the same problem described above for OASs and the ten-year yield holds for prices and the ten-year yield. That is, underlying trends affecting the cumulative price change are *not* captured by the empirical duration derived from daily changes.

In a future article, we will examine level empirical durations,⁶ which capture the effect of cumulative changes in price, but which can also be misleading if daily changes are of most interest.

$$\text{Correlation} = \frac{\sum (s_i - \bar{s})(t_i - \bar{t})}{\sqrt{\sum (s_i - \bar{s})^2 \sum (t_i - \bar{t})^2}}$$

where s_i = daily change in OAS

⁵ t_i = daily change in 10-Yr Yield

As seen from the formula, adding a constant such as -2bp to each daily change in OAS essentially cancels out, since the formula involves *deviations* from the mean. So if both the changes and the mean are taken down by 2, the difference between the changes and mean is the same.

⁶ See *Effective and Empirical Durations of Mortgage Securities*, September 1996.