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High Grade
North America

US High Grade Strategy Focus

Curve Report: The case for 10s30s spread curve steepeners

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- **Anchors away** — Two critical anchors of long-end credit spread curves may become dislodged by year end, as Asian lifers face down potential regulatory limits on oversized foreign bond positions, and a tax incentive for U.S. corporate pension bond inflows expires in mid-September. The pension technical creates a brief window of liquidity for portfolio managers to reduce long-end positions that we think should be seized.

- **Protect for a rates rally** — We find 10s30s credit spreads are negatively correlated with the level of Treasury yield and the shape of rates yield curve, and positively correlated with index-level credit spreads. This makes 10s30s spread curves especially vulnerable to steepening in a traditional risk-off rally in rates. With our rates strategists calling for a return to 2.60% Treasuries and potentially flat to inverted yield curves, 10s30s spreads could steepen 10 bps or more under our regression model, and potentially more if overall spread levels steepen. Meanwhile, issuers are hitting the market with more 20+ year bond supply than ever.

- **New Citi issuer-matched spread curve analytics** — With this publication, we introduce a series of IG spread curve analytics and charts, using median, issuer-weighted and market value-weighted spread curves, all issuer-matched, for 2s5s, 5s10s, and 10s30s. At the sector level, we calculate Z-scores over a 120d lookback to help identify significant dislocations.

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See Appendix A-1 for Analyst Certification, Important Disclosures and non-US research analyst disclosures.

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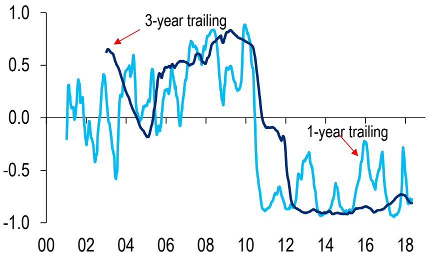
The case for steeper 10s30s spread curves

The shape of camels, the shape of bees and the wonderful shapes of back door keys… Of all the shapes we might have been, I say hooray for the shapes we're in!

In this new series of strategy notes called *Curve Report*, we take inspiration from a famous children's poet's celebration[1] of everyday forms to contemplate the wondrous shape of high-grade spread curves over the credit cycle. Our aim in these publications will be to provide a clearer understanding of the drivers of credit spreads between various maturity points, and to develop a coherent and balanced curve trade recommendation – in this case, for back-end spread curve steepeners, a view we caveat below with important flattening pressure that may develop around September. Underlying our analysis will be a variety of newly constructed issuer-matched IG spread curve analytics to be published on Citi Velocity on a regular basis. Our curve analytics provide a more accurate picture of spread curve trends than standard index-level analysis by incorporating only those issuers with index-eligible bonds on both the long and short leg of the pair, and are calculated – outright and by sectors -- as medians, issuer-weighted averages, and market value weighted averages– to account for the various ways that curve trades can be implemented.

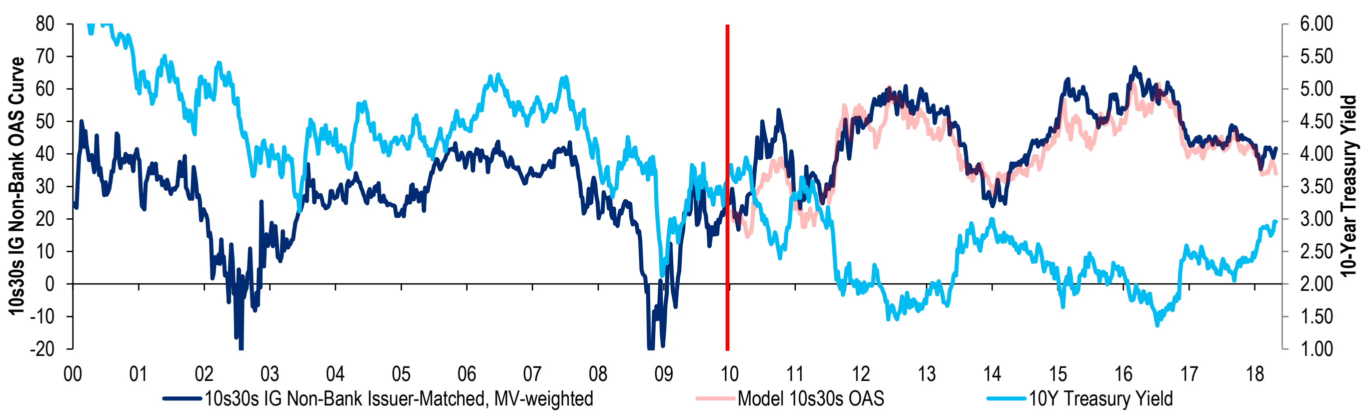
Figure 1. Correlation of IG non-bank 10s30s OAS with 10-year Treasury yield



Source: Citi Research; Bloomberg Financial LP

Our maturity-pair focus in this debut *Curve Report* is the nexus of 10-year and 30-year investment grade spreads, a combination we find fascinating for several reasons. First, to simplify slightly, 10s30s is the meeting place of two very different investor types in high-grade credit – the excess-return driven investor (10-year) and the yield-sensitive investor (30-year) – which we hypothesize makes spread curve movements highly sensitive to the outright level of Treasury yields. (See Figure 1. Correlation of IG non-bank 10s30s OAS with 10-year Treasury yield)

Figure 2. Since 2010, the 10s30s IG spread curve has moved inversely with the level of Treasury yields and rate curve, and directly with IG OAS



Source: Citi Research

Figure 3. Regression results (10s30s OAS)

Variable	Coeff	Std. Error	t-Stat	Prob
Intercept	73.78	2.04	36.22	0.00
10s30s Tsy	-0.07	0.01	-7.34	0.00
10y Tsy Yld	-0.15	0.00	-33.53	0.00
IG xFin OAS	0.10	0.01	9.48	0.00
R^2	0.80	Adj R^2	0.80	
F-stat	564.70	Prob (F)	0.00	

Source: Citi Research; Bloomberg Financial LP

Second, two critical anchors of long-end credit demand, U.S. defined-benefit pensions, which hold an estimated $600 bn in corporate bonds, and Taiwanese life insurers, which hold roughly $500 bn in foreign bonds, are currently in the midst of dramatic financial and regulatory shifts that pose exogenous risks to curve shape beyond the level of rate. Third, issuers are pumping out more long-end supply than they have in years, a development we do not yet see being properly reflected in spread curve shapes (See Figure 4. Proportion of issuance in the 15-25 yr and 25+ year bucket, US non-financial IG.

[1] "The shape of me and other stuff: Dr. Seuss's surprising word book." New York: Random House.

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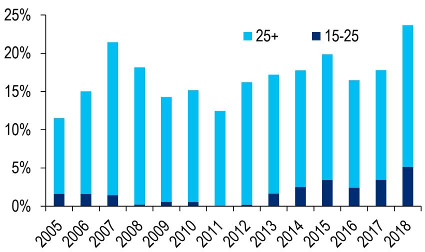
Finally, the outright level of yield pickup between 10-year and 30-year paper has declined sharply as the Fed has raised short-term rates. 10s30s yield curves are approaching 15 bps in Treasuries and 50 bps for high-quality IG paper, down from post-crisis peaks of roughly 125 bps and 160 bps, respectively.

Figure 4. Proportion of issuance in the 15-25 yr and 25+ year bucket, US non-financial IG



Source: Citi Research; Dealogic

Follow the yield

No factor better captures the movement in 10s30s spread curve shape in the post-crisis period than the level of Treasury yield. For most of the past eight years, we observe a significantly negative one-year trailing correlation between the level of rate (which we proxy with the 10-year Treasury yield) and the shape of the 10s30s spread curve. On a three-year trailing basis, the correlation is steadily negative for most of the post-crisis period (see Figure 1. Correlation of IG non-bank 10s30s OAS with 10-year Treasury yield). The negative correlation is thematically consistent with a model of credit demand in which there is greater yield sensitivity among 30-year credit investors. After adjusting for the level of rate, we also find a statistically significant influence from the level of credit spread and the shape of the Treasury curve. (For more, see US High Grade Strategy Focus: 10s30s sector relative value in US IG). We combine these three factors into a fair value model shown in Figure 2. The model implies that 10s30s curves are 6 bps steeper than fair value, a gap we can explain with exogenous factors including constraints on portfolio growth among Asian life insurance companies and heavy back-end supply. Results our regression are available in Figure 3. Regression results (10s30s OAS).

We can interpret the model by considering the impact of one standard deviation moves in each of the explanatory variables. The model implies that 10s30s spread curves, in the post-crisis period, would move 8.5 bps flatter in a 55 bps sell-off in 10-year rates, move 2 bps flatter in a 26 bps steepening of the 10s30s rate curve, and 2.5 bps steeper in a 25 bps widening in US IG credit spreads. We would not be too quick to fade the weakness in the back-end. Citi rates strategists believe that longer-dated Treasuries can continue to rally and would not be surprised to see an inverted curve later in the year. A push to 2.60% Treasuries, a flat 10s30s curve, and IG credit spreads 15 wider implies 9 bps of 10s30s IG spread curve widening.

Not a pan-cycle story

A significant shortcoming of the model is its breakdown in the pre-crisis regime. Part of this is that the model works best within the same credit cycle, not across credit cycles. Because full-blown credit default cycles tend to invert spread curves – observable in Figure 2 in both 2002 and 2008 – the model would be inappropriate to apply to such a scenario. That said, we think the model provides a helpful framework for considering moderate changes in risk appetite and yield level. For this reason, we run the regression within the post-crisis period to avoid credit cycle turns. Prior to 2010, the level of rates and spread curve were positively correlated, while after 2010 they are negatively correlated. This shift in correlation may be a function of the overall higher level of rates before the crisis; changing investor bases, e.g. the growth of large, yield sensitive 30-year credit portfolios; and shifting curve dynamics associated with short-term rates at the zero lower bound for the Fed's policy rate, which we hit in late 2008.

Anchors away

The correlation between lower risk-free yields and steeper 10s30s spread curves is made more intuitive if one considers the 30-year maturity point as a popular habitat for yield-sensitive investors, such as life insurers and defined-benefit pension plan managers that make long-term contractually guaranteed obligations. If these investors have in mind specific yield targets, demand may be anchored around

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specific yield levels. So when risk-free rates decline, credit spreads may need to widen to satisfy the income needs of these investors. Because more of this yield-sensitive demand is clustered around the 30-year point, the widening pressure would be felt more in the back end of the curve. An illustrative example of this yield sensitive demand can be found in the Taiwan life insurance community, where insurers report on a quarterly basis the difference between their investment yield of (3.95%, in one recent example) and their cost of liabilities (3.67%, in this case). Lifers must balance the all-in yields of 30-year USD IG corporate bonds – which range between 4.2% for 30-year AA paper to 4.85% for BBB+ paper – against the cost of currency hedges, which eat up one or two percentage points of yield, depending upon the hedge ratio. Lower yields and flatter 10s30s risk-free curves could in theory these investors out of the market, requiring spreads to move wider for the market to return to equilibrium.

At all levels of yields, Taiwan lifers may become smaller net buyers of US credit given the very high proportion (65%) of assets held in foreign bonds and the apparent shift in these portfolios toward emerging market paper. This year, emerging market corporates and sovereigns represent 30% of the issuance of foreign-issuer Formosa bonds – USD paper listed on the Taipei exchange – up from 15% in 2017 and 6% in 2016. In addition, legislators have begun to discuss for the first time soft limits on aggregate foreign bond holdings that include both Formosa and non-Formosa positions. As we have noted, we think it is conceivable that regulators may at some stage decide to raise the 45% cap on non-Formosa foreign bonds as a way to shift lifers' portfolios away from less liquid Formosa bonds and back into secondary credit markets, which could have the somewhat counterintuitive effect of driving up demand for 30-years. However, there is not yet any indication that this is a scenario being actively considered (See US High Grade Strategy Focus: Taiwan's foreign bond hot-pot).

Timing the pension flows is trickier. On the one hand, we would expect upwards of tens of billions of back-end high quality credit demand to flow into the market, likely around the beginning of September, which could push demand lower. Pension funding that occurs before Sept 15 will in most cases qualify to be deducted against 2017 income, when corporate tax rates were higher. The tax shield of a pension investment at 35% is substantially larger than at a 21% tax rate, and we have demonstrated that an upfront $30 billion pension investment enjoys a $6.5 bn NPV advantage over a pension investment made over 10-years, when both tax and government insurance fees are considered (See US IG Credit Strategy: Yield Enhancement, or Enchantment?). However, these flows have also been in the market for some time, and we think have been adding to flattening pressure in recent months. Therefore, we tend to view the upcoming pension demand through September as offering a window of liquidity for larger portfolio shifts away from the back end. Moreover, the pension technical has no reason to continue beyond September or early October (assuming it takes 2-3 weeks to invest the pension contributions), giving us higher confidence that momentum in the back end will weaken in the fourth quarter.

Fed hikes, and the pain point of rates curve flatness

While our fair value model shows a stronger correlation between 10s30s spread curves and the *level* of Treasury yields, the model does indicate a negative beta between spread curves and the 10s30s Treasury yield curve. And beyond that correlation, we do find an interesting historical parallel between today's Fed hike environment (see Figure 5. IG 10s30s OAS vs Treasury curve, 2016-) and the experience of 2005 and 2006. Between the first and fifth fed funds hikes of the 2004 cycle, as the Fed brought overnight rates from 1.25% to 2.25%, we saw 10s30s

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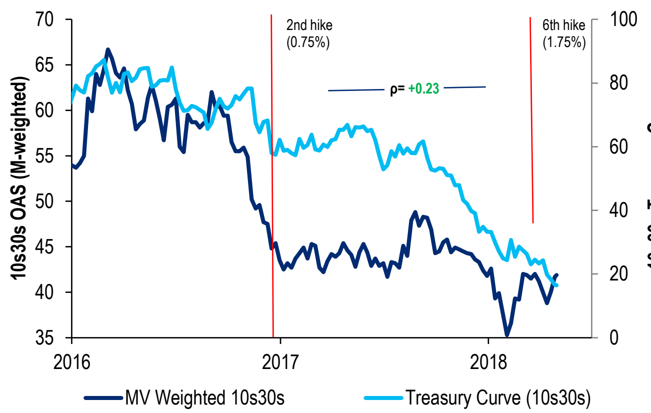
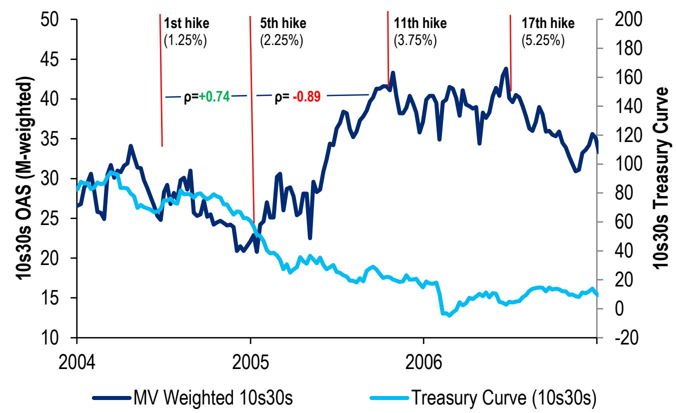
spread curves flatten along with the 10s30s rates curve – similar to what we have experienced as the fund funds rate has been increased from 0.75% to 1.75%. Last cycle, however, as the 10s30s Treasury curve pushed lower toward 20 bps as the Fed kept hiking, we witnessed correlations switch to being negative, and 10s30s spread curves moved steeper by 15 bps over the course of 2005 (See Figure 6. IG 10s30s OAS vs Treasury 10s30s yied, 2004-2006). With the Treasury curve having moved below 20 bps, and the Fed expected to hike twice more in 2018, the echoes with the steepening episode of 2005 adds to our concerns around steepening.

Figure 5. IG 10s30s OAS vs Treasury curve, 2016-



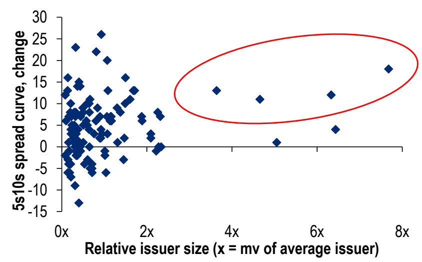
Source: Citi Research; Bloomberg Financial LP

Figure 6. IG 10s30s OAS vs Treasury 10s30s yied, 2004-2006



Source: Citi Research

Figure 7. Curve change vs size, April 2018



Source: Citi Research; Bloomberg Financial LP

Issuer matched curves, three ways

In this next section, we discuss the composition of the issuer-matched spread curves used in the above analysis and present a series of charts and tables, to be included in a future recurring analytical report. We focus on non-bank curves, selecting all of an issuers' bonds from the 2Y, 5Y, 10Y, and 30Y maturity bucket, and aggregating only those issuers for which there are index-eligible bonds on both the short and long leg of the curve. We then aggregate the issuer-level curves in three ways – first, by selecting the median issuer, which eliminates the impact of outliers. Second, we show issuer-weighted curves, in which each issuer's curves are weighted equally. Third, we show market-value weighted curves, which are weighted by an issuers' index level market value. In addition, we exclude from our samples bonds with any rating of BB+ or below from any of the three major issuers. The issuer- and market value- weighted spread curves move together over time but can diverge when large capital structures diverge, as they did in April, when large issuers (with market values between 4 and 8 times the average) steepened in 5s10s (see Figure 7. Curve change vs size, April 2018).

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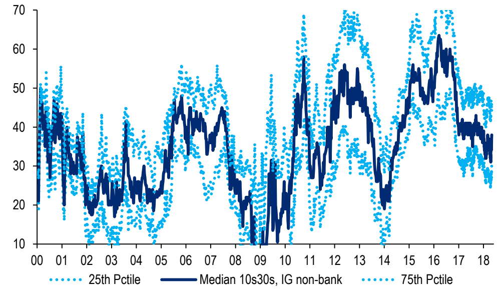
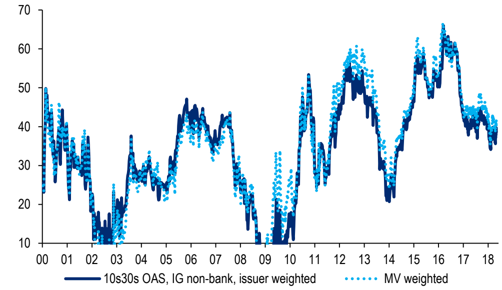
Figure 8. 10s30s IG OAS, medians and interquartile range, 2000-



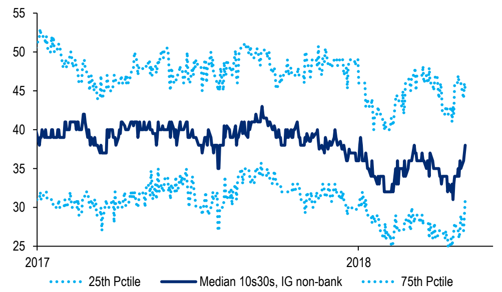
Source: Citi Research

Figure 9. 10s30s IG OAS, issuer- and market value weighted avg, 2000-



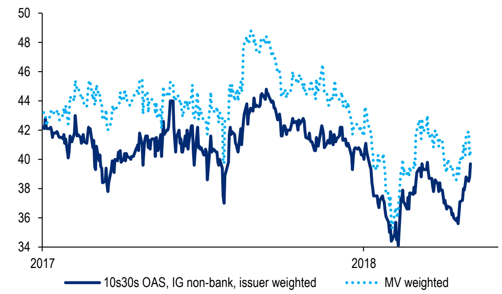
Source: Citi Research

Figure 10. 10s30s IG OAS, medians and interquartile range, 2017-



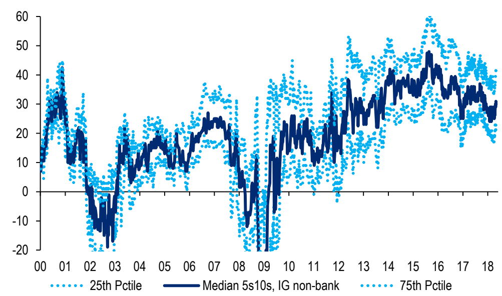
Source: Citi Research

Figure 11. 10s30s IG OAS, issuer- and market value weighted avg, 2017-



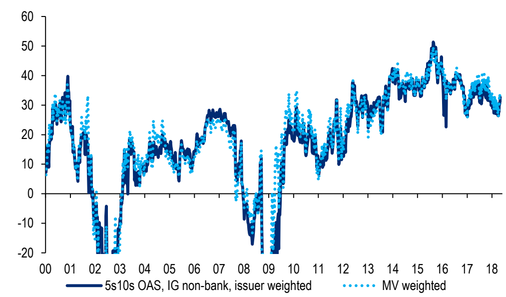
Source: Citi Research

Figure 12. 5s10s IG OAS, medians and interquartile range, 2000-



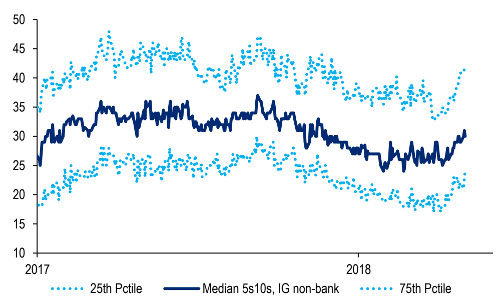
Source: Citi Research

Figure 13. 5s10s IG OAS, issuer- and market value weighted avg, 2000-



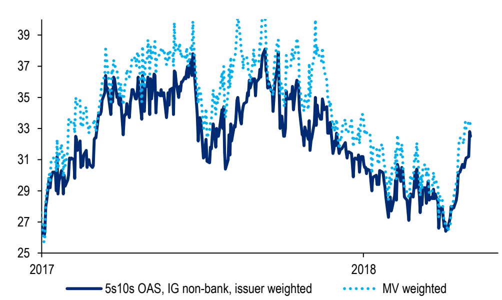
Source: Citi Research

Figure 14. 5s10s IG OAS, medians and interquartile range, 2017-



Source: Citi Research

Figure 15. 5s10s IG OAS, issuer- and market value weighted avg, 2017-



Source: Citi Research

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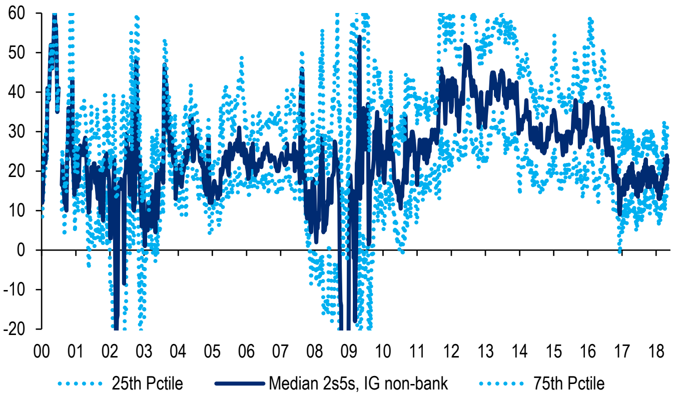
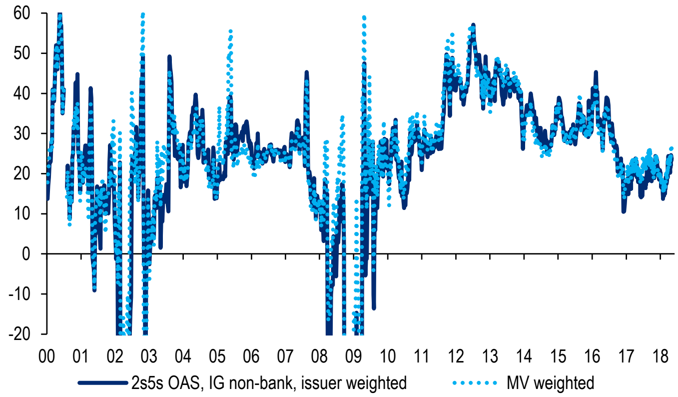
Figure 16. 2s5s IG OAS, medians and interquartile range, 2000-



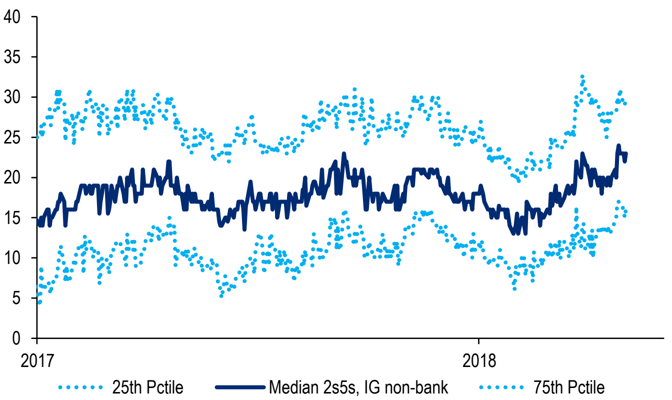
Source: Citi Research

Figure 17. 2s5s IG OAS, issuer- and market value weighted avg, 2000-



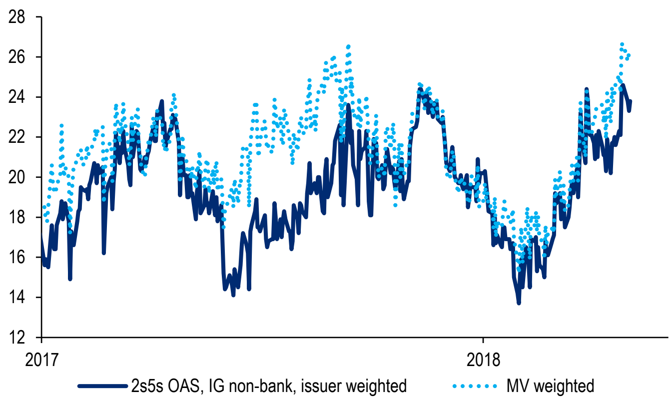
Source: Citi Research

Figure 18. 2s5s IG OAS, medians and interquartile range, 2017-



Source: Citi Research

Figure 19. 2s5s IG OAS, issuer- and market value weighted avg, 2017-



Source: Citi Research

Figure 20. 10s30s sector spread curves

US IG credit curves, served three ways

10s30s OAS, 120d analytics

	Median Issuer				**Average** Issuer				**MV** Weighted			
10s30s (Non-Bank)	Flats	Last	Steeps	Z	Flats	Last	Steeps	Z	Flats	Last	Steeps	Z
IG	31	38	39	**+1.9**	34	40	41	+1.4	35	41	44	+0.2
AAA-AA	22	25	30	-0.4	22	28	28	**+2.2**	22	34	34	**+2.8**
A	27	34	37	**+1.5**	29	36	36	**+2.3**	30	37	39	**+1.5**
BBB	37	42	45	+0.5	39	44	48	+0.4	45	46	56	**-1.9**
Technology AAA-A	25	39	39	**+3.3**	25	42	42	**+3.5**	23	40	40	**+2.8**
Insurance	25	47	47	**+2.8**	25	46	46	**+2.5**	25	44	44	**+2.7**
Autos	52	72	75	**+1.7**	52	72	75	**+1.7**	55	74	77	**+1.6**
Transportation	23	37	38	**+1.6**	23	41	41	**+1.8**	25	41	41	**+1.7**
Utilities	21	29	30	**+1.5**	22	28	31	+0.6	22	28	32	+0.3
Retail	25	34	38	+1.0	27	36	38	+1.0	26	37	39	**+1.5**
Healthcare	29	37	42	+0.8	31	37	38	**+1.5**	30	36	39	+0.7
Other Financial	23	32	38	+0.5	23	31	38	+0.2	21	31	34	+0.9
Media	31	40	48	+0.1	35	45	48	**+1.6**	34	42	48	+0.6
Capital Goods	21	27	32	+0.1	25	33	33	**+2.4**	24	28	31	+0.2
Chemicals	26	35	46	0	37	47	53	+1.0	35	44	51	+0.9
Food	31	39	47	-0.1	35	41	45	+0.8	31	39	44	+0.8
Pharmaceuticals	22	32	42	-0.3	27	35	40	-0.1	29	36	41	-0.2
Energy	40	44	52	-0.9	43	48	55	-0.8	47	47	59	**-2.4**
Pharmaceuticals	22	24	42	**-1.8**	27	32	40	-0.8	29	35	41	-0.3
Consumer Non-Cyclical	16	16	28	**-2.5**	16	16	28	**-2.5**	9	9	25	**-3.1**

Source: Citi Research

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Figure 21. 5s10s spread curve analysis

US IG credit curves, served three ways

5s10s OAS, 120d analytics

	Median Issuer				Average Issuer				MV Weighted			
5s10s (Non-Bank)	Flats	Last	Steeps	Z	Flats	Last	Steeps	Z	Flats	Last	Steeps	Z
IG	24	30	31	+2.1	26	33	33	+2.6	26	33	34	+1.6
AAA-AA	16	25	27	+1.2	17	25	26	+1.9	19	25	29	+0.9
A	19	24	26	+0.8	20	27	27	+2.2	18	28	28	+2.7
BBB	29	40	40	+3.4	31	37	38	+2.3	33	41	44	+0.5
Food	19	36	36	+2.4	23	36	36	+2.8	20	38	41	+2.1
Healthcare	27	41	42	+2.2	28	37	38	+1.6	21	32	32	+2.6
Pharmaceuticals	12	26	27	+2.1	15	31	31	+3.7	17	31	32	+2.7
Chemicals	19	42	46	+1.8	23	41	46	+1.5	21	41	46	+1.7
Other Financial	16	29	36	+1.7	23	31	32	+2.4	19	30	32	+2.4
Transportation	10	27	29	+1.7	12	26	28	+1.8	11	25	27	+1.6
Capital Goods	17	27	28	+1.6	18	28	28	+2.4	17	34	34	+2.8
Autos	23	43	44	+1.5	27	33	41	-0.2	27	32	46	-1.0
Utilities	17	30	33	+1.0	20	27	31	+0.2	15	26	30	+0.4
Technology AAA-A	18	26	30	+0.7	18	28	30	+1.7	19	27	30	+1.4
Consumer Non-Cyclical	19	27	33	+0.6	19	27	33	+0.6	19	27	32	+0.7
Technology BBB	25	38	49	+0.4	25	34	41	+0.3	25	32	54	-0.3
Energy	21	31	41	+0.3	25	34	39	+1.2	21	30	37	+0.8
Retail	25	30	35	+0.2	27	33	34	+1.6	25	31	32	+1.2
Insurance	20	28	36	-0.1	20	28	36	-0.1	17	29	36	+0.4
Media	14	34	57	-0.1	22	39	48	+0.3	20	36	43	+0.4
Communications	32	40	60	-0.7	32	44	60	-0.7	31	54	63	+0.3
Real Estate	17	22	43	-1.5	21	29	43	-1.1	22	29	47	-1.3

Source: Citi Research

Figure 22. IG 2s5s spread curve analysis

US IG credit curves, served three ways

2s5s OAS, 120d analytics

	Median Issuer				Average Issuer				MV Weighted			
2s5s (Non-Bank)	Flats	Last	Steeps	Z	Flats	Last	Steeps	Z	Flats	Last	Steeps	Z
IG	13	23	24	+1.9	14	24	25	+1.7	15	26	27	+2.0
AAA-AA	9	19	22	+1.4	8	21	21	+2.1	9	24	24	+1.8
A	10	18	22	+0.8	10	19	23	+0.8	12	22	24	+1.5
BBB	17	28	28	+2.3	18	29	30	+2.1	19	32	34	+2.0
Food	12	28	28	+2.4	12	23	27	+1.1	13	26	31	+1.5
Healthcare	10	27	29	+2.3	15	23	27	+1.1	13	27	31	+1.5
Communications	7	36	36	+2.1	4	35	37	+2.2	13	35	38	+1.7
Energy	9	20	23	+1.8	10	23	26	+1.8	10	24	25	+2.2
Chemicals	7	23	28	+1.6	7	24	25	+2.3	7	25	25	+2.3
Pharmaceuticals	8	23	26	+1.4	10	23	26	+1.1	10	23	26	+1.2
Technology AAA-A	14	26	29	+1.3	13	30	30	+1.9	12	30	30	+1.8
Technology BBB	13	34	43	+1.3	20	34	40	+1.2	23	38	48	+0.1
Other Financial	8	24	29	+1.3	12	25	29	+1.1	9	25	33	+0.9
Insurance	10	33	54	+0.8	10	24	54	0	10	31	55	+0.5
Autos	4	15	21	+0.6	13	28	28	+2.7	20	37	37	+2.7
Utilities	10	19	27	+0.5	9	21	26	+1.3	9	20	25	+1.0
Capital Goods	10	17	28	+0.3	11	16	24	+0.1	12	18	26	+0.2
Retail	12	18	23	+0.3	3	20	21	+1.7	7	20	22	+1.5
Media	10	21	31	0	11	21	30	-0.4	8	20	29	+0.2
Consumer Non-Cyclical	7	16	29	-0.1	7	16	29	-0.1	8	17	29	0
Real Estate	4	18	34	-0.2	4	18	34	-0.2	4	16	39	-0.6

Source: Citi Research

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Appendix A-1

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