

**Simon Polbennikov**

+44 20 3134 0752

simon.polbennikov@barclays.com

Barclays, UK

Size Effect in Corporate Bond Returns

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Executive Summary

- Size premium in equities is well known and documented
- Size premium in credit is less well researched
 - Houweling, P., and J. Van Zundert, 2017 find positive size premium in corporate bonds
 - Alquist, R., R. Israel, and T. Moskowitz, 2018 find negative size premium in credit
- We analyse effect of issuer size on spread and performance in US IG and HY markets
 - We define issuer size as the total amount of issuer's debt outstanding in Bloomberg Barclays US IG and HY indices
 - Bonds issued by smaller issuers typically have higher spreads other things equal. Average *spread* premium associated with issuer size was 9bp in US IG and 21bp in US HY between 2007 and 2018 . However, this additional spread carry does not automatically mean that Small issuer outperform Large issuer portfolios.
 - We find that bonds of Small issuers tend to underperform bonds of Large issuers when controlled for bond and issuer characteristics including spread. The annualized underperformance is -50bp/yr in US IG between 1994 and 2018.
 - Additionally, periods when Small issuers outperform Large issuers are associated with market distress and poor liquidity. We believe that pricing of bonds issued by smaller issuers can be subject to significant errors during those periods.
 - Excess returns of smaller issuer portfolios appear to be less volatile than those of larger issuers, for a similar spread exposure. However, this phenomenon is likely attributable to the illiquidity of smaller size bonds.

Average Issuer Size by Sector

- Average issuer size, measured by amount of debt outstanding in the Bloomberg Barclays indices, is currently USD 6.7bn for US IG and 1.4bn for US HY
- Average size is larger in Banking, Communication, and Technology (US IG) and Communication (US HY)
- Bonds with amount outstanding below 300m and 250m are not included in the US IG and HY indices, respectively

US Corporate Issuers by Sector, 30 April 2018

	US Corporate IG			US HY		
	# Issuers	Amount, \$bn	Avg. Size, \$bn	# Issuers	Amount, \$bn	Avg. Size, \$bn
BASIC INDUSTRY	43	147	3.4	101	95	0.9
CAPITAL GOODS	63	214	3.4	107	111	1.0
CONSUMER CYCLICAL	57	348	6.1	160	179	1.1
CONSUMER NON CYCLICAL	116	808	7.0	108	178	1.7
TRANSPORTATION	20	111	5.5	24	19	0.8
COMMUNICATIONS	33	443	13.4	90	257	2.9
TECHNOLOGY	52	425	8.2	66	88	1.3
ENERGY	64	471	7.4	138	186	1.4
INDUSTRIAL OTHER	16	17	1.1	27	17	0.6
UTILITY	56	313	5.6	22	33	1.5
BANKING & BROKERAGE	86	1,209	14.1	27	43	1.6
INSURANCE	62	217	3.5	23	23	1.0
FINANCIAL OTHER	66	205	3.1	41	60	1.5
Total	734	4,928	6.7	934	1,288	1.4

Source: Bloomberg Barclays Indices, Barclays Research

Issuer Size Has Increased over Time in All Sectors

- Issuer size has been increasing over time in all sectors
- Focus should be on relative size

Average Issuer Size by Sector, 1998 - 2018

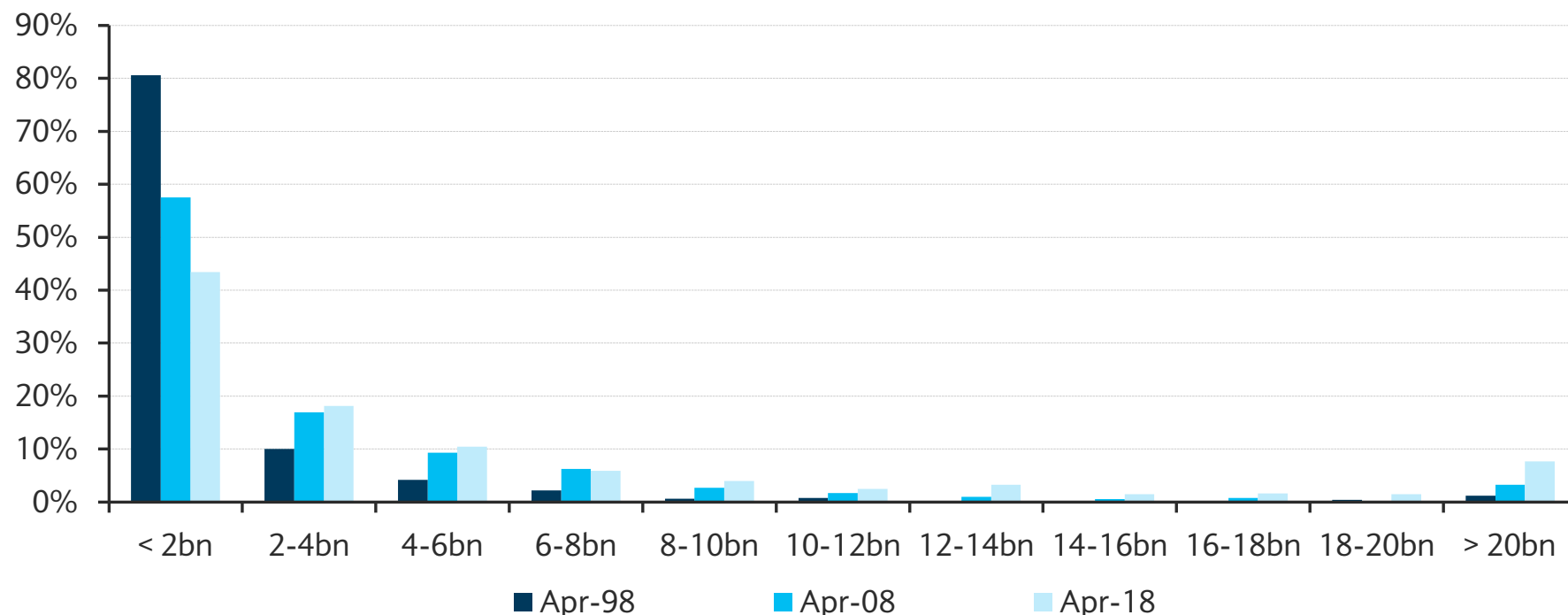
	US Corporate IG					US HY				
	1998	2003	2008	2013	2018	1998	2003	2008	2013	2018
BASIC INDUSTRY	0.9	1.5	1.8	3.6	3.4	0.3	0.7	0.6	0.9	0.9
CAPITAL GOODS	1.1	1.9	2.3	2.9	3.4	0.3	0.7	0.6	1.0	1.0
CONSUMER CYCLICAL	1.6	3.4	4.1	4.9	6.1	0.3	0.6	1.0	0.9	1.1
CONSUMER NON CYCLICAL	1.1	1.9	2.7	4.4	7.0	0.3	0.4	0.8	1.0	1.7
TRANSPORTATION	1.2	2.0	2.5	3.9	5.5	0.2	0.6	0.5	0.7	0.8
COMMUNICATIONS	2.9	3.9	7.0	8.9	13.4	0.6	1.1	1.2	2.0	2.9
TECHNOLOGY	0.5	1.5	2.5	3.5	8.2	0.3	0.8	0.9	1.2	1.3
ENERGY	1.2	2.1	2.5	5.2	7.4	0.3	0.4	0.6	1.0	1.4
INDUSTRIAL OTHER	0.4	0.5	0.6	0.5	1.1	0.2	0.3	0.3	0.5	0.6
UTILITY	1.4	2.0	2.5	4.1	5.6	1.2	1.6	1.3	1.8	1.5
BANKING & BROKERAGE	2.4	4.0	9.0	9.5	14.1	0.3	0.3	0.8	1.8	1.6
INSURANCE	0.7	1.4	2.6	2.8	3.5	0.2	0.4	0.5	0.5	1.0
FINANCIAL OTHER	2.1	4.3	4.0	3.5	3.1	0.3	0.5	1.6	1.4	1.5
Total	1.4	2.6	3.7	4.7	6.7	0.3	0.7	0.9	1.1	1.4

Source: Bloomberg Barclays Indices, Barclays Research

The Share of Smaller Size Issuers Has Decreased

- Many IG index issuers are of small or modest size (\$2bn and less)
- The number of larger size issuers has increased over time
- Between 1998 and 2018, the proportion of index issuers with \$2bn and less of index debt decreased from 80% to 43%
- The proportion of issuers with more than \$20bn of index debt increased from 1.2% to 7.7%

Issuer Size Distribution in the IG Index (by Issuer Count)



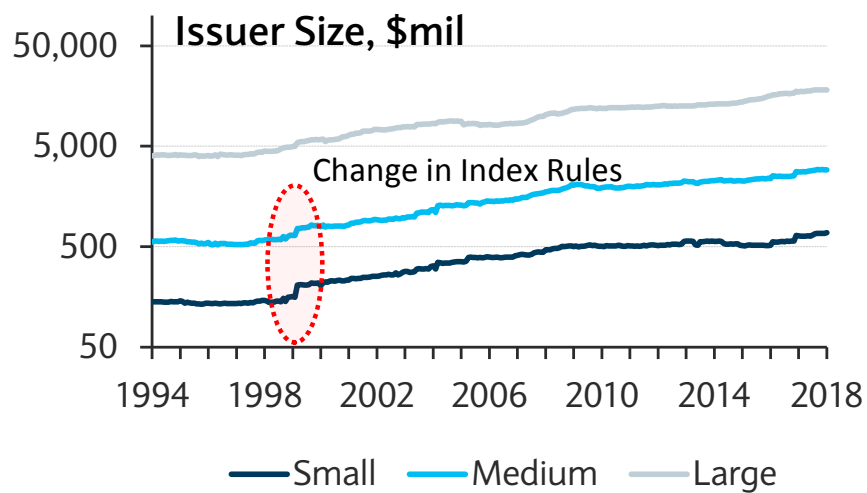
Source: Bloomberg Barclays Indices, Barclays Research

Credit Portfolios Based on Size

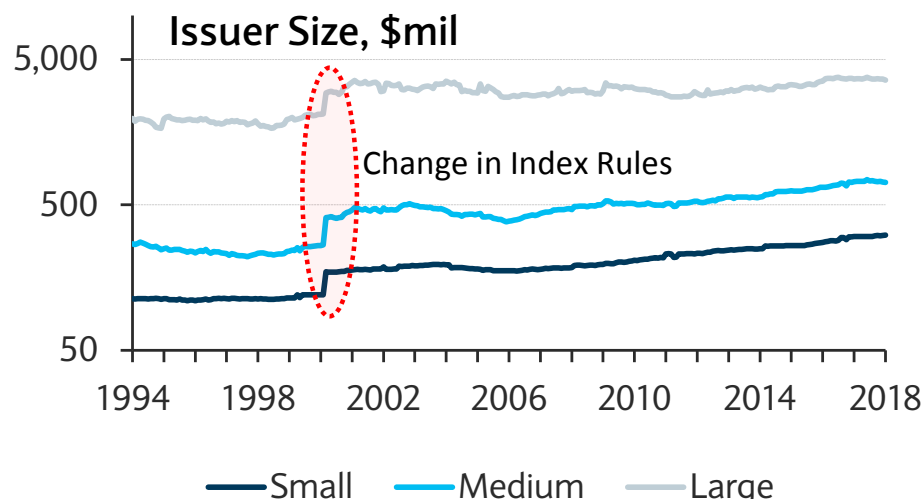
- We define *Issuer Size* as the amount of issuer's debt outstanding in Bloomberg Barclays US IG and HY indices
 - This is similar to Houweling, P., and J. Van Zundert (2017), who define Size based on an issuer's index weight
- Each month we create *Size Portfolios* by allocating issuers according to Size into *Small* (bottom 30%), *Medium* (30-70%), and *Large* (top 30%) buckets
- Average issuer size in US IG increased from \$140m to \$680m in Small Size and from \$4bn to \$18bn in Large Size portfolios between 1994 and 2018
- Average size in US HY increased from \$115m to \$310m in Small Size and from \$1.9bn to \$3.6bn in Large Size portfolios between 1994 and 2018
- Note that minimum amount outstanding of index-eligible bonds increased several times during the period

Average Issuer Size in SML Credit Portfolios

US Corporate IG



US High Yield



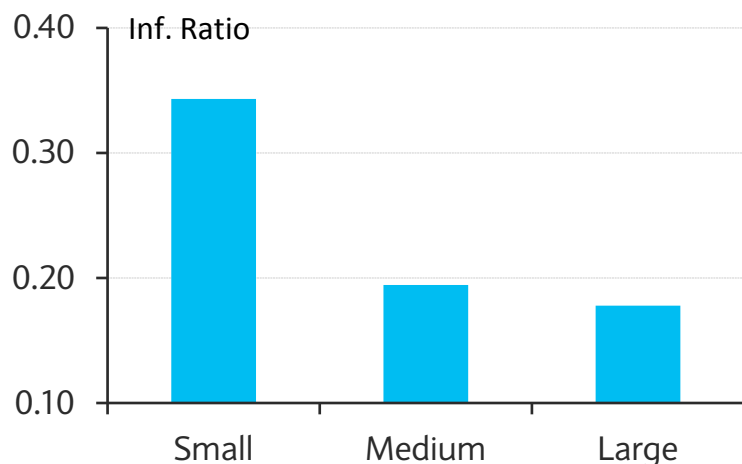
Source: Bloomberg Barclays Indices, Barclays Research

Performance of Size Portfolios

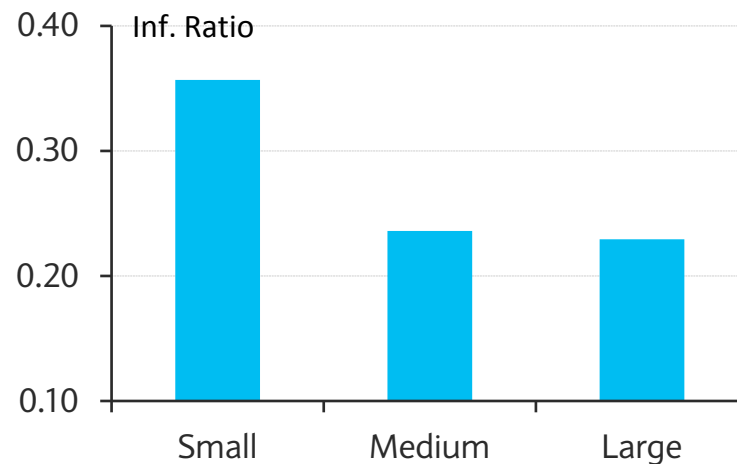
- Small Size portfolios have outperformed their Large Size peers between 1994 and 2018

Performance of Size Portfolios: January 1994 – April 2018

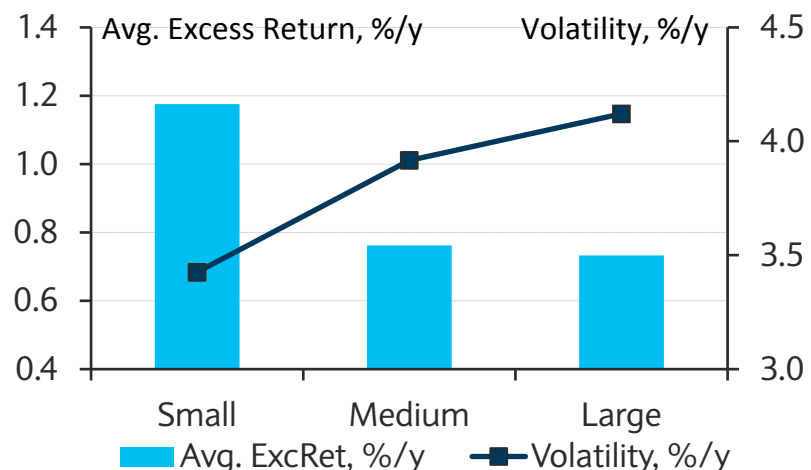
US IG: Information Ratios



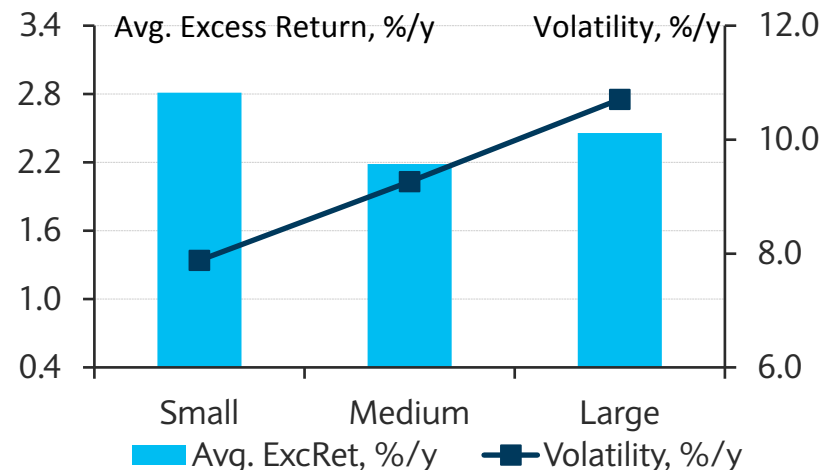
US HY: Information Ratios



US IG: Avg. Returns and Volatilities



US HY: Avg. Returns and Volatilities



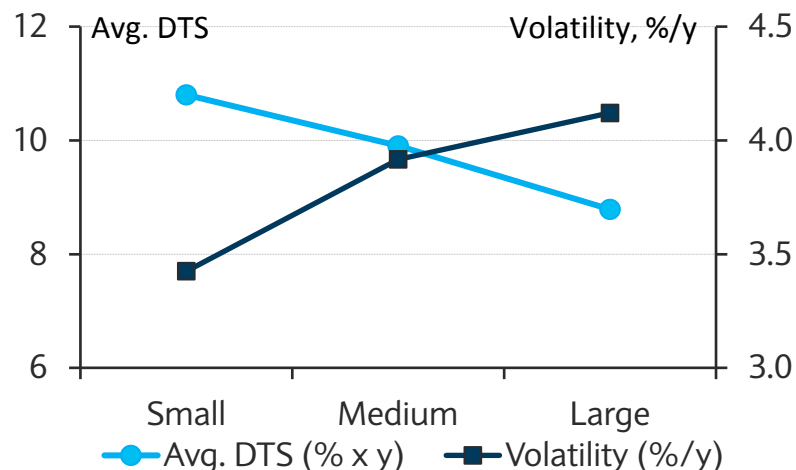
Source: Barclays Research

Small Size Portfolios Appear Less Risky...

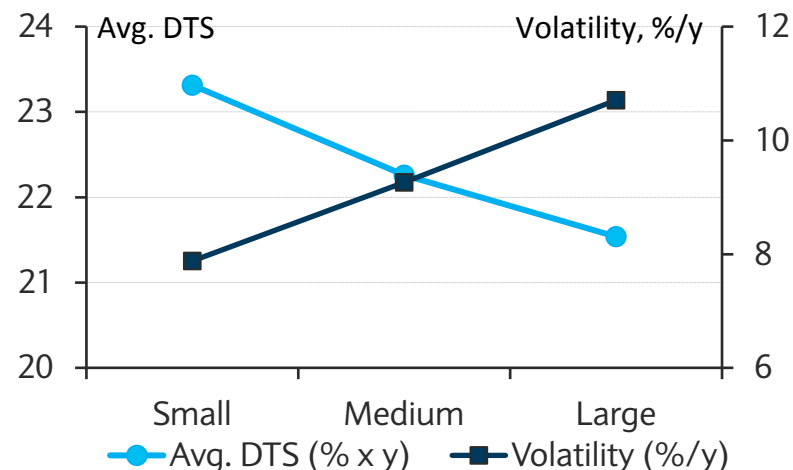
- Small Size portfolios appear less volatile than Large Size ones despite higher spread exposure

Credit Risk of Size Portfolios: January 1994 – April 2018

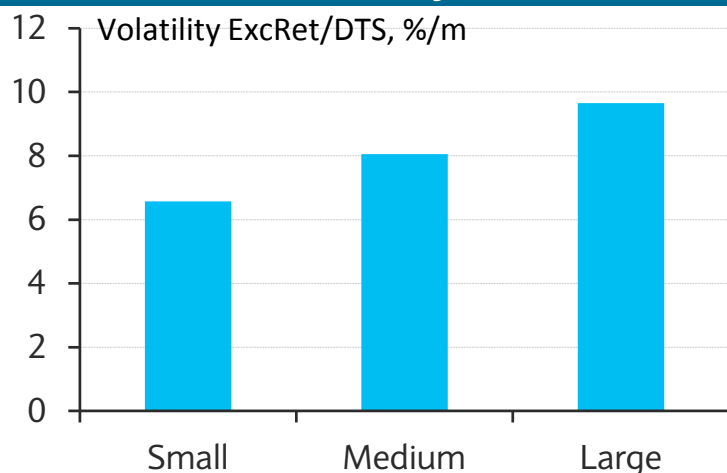
US IG: DTS vs Volatility



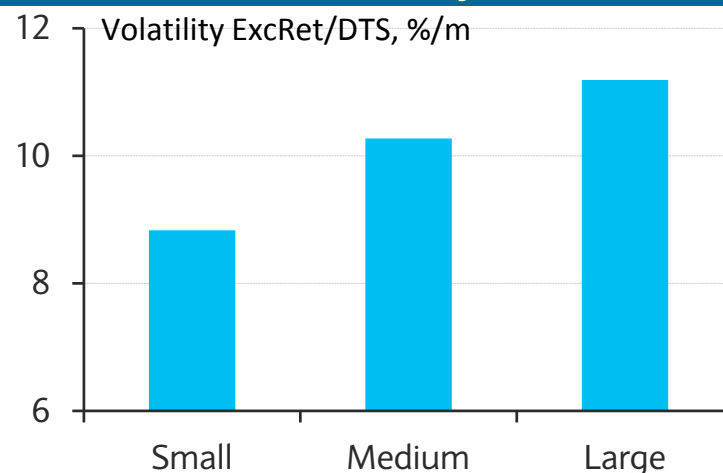
US HY: DTS vs Volatility



US IG: Volatility Per DTS



US HY: Volatility Per DTS



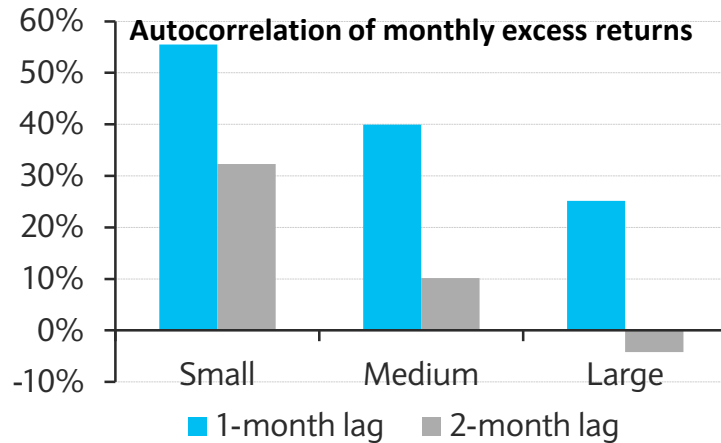
Source: Barclays Research

... but This Might Be Related to Illiquidity

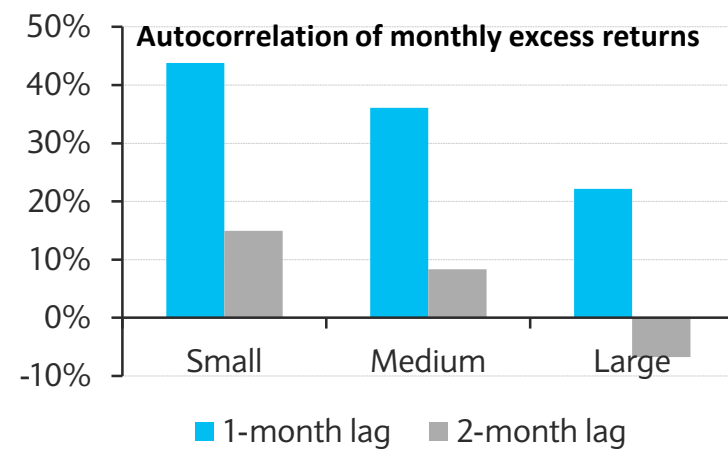
- Small Size portfolios are less liquid and exhibit higher autocorrelation of excess returns

Return Autocorrelation and Liquidity Cost Score of Size Portfolios

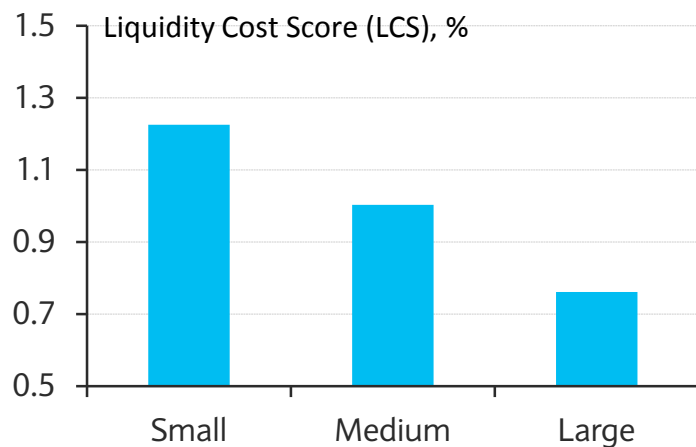
US IG: Autocorrelation, 1994 - 2018



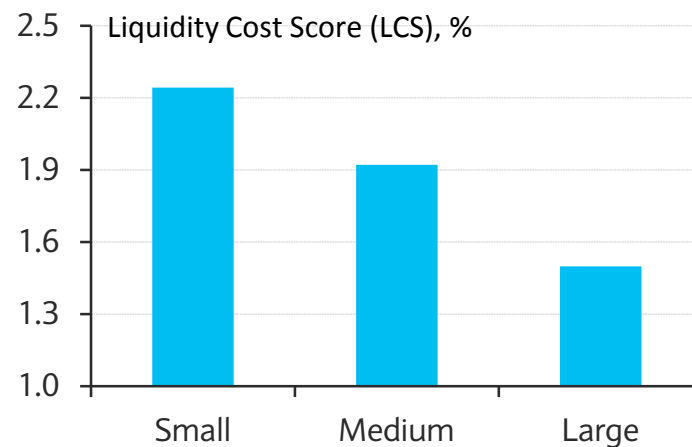
US HY: Autocorrelation, 1994 - 2018



US IG: Avg. LCS, 2007 - 2018



US HY: Avg. LCS, 2007-2018



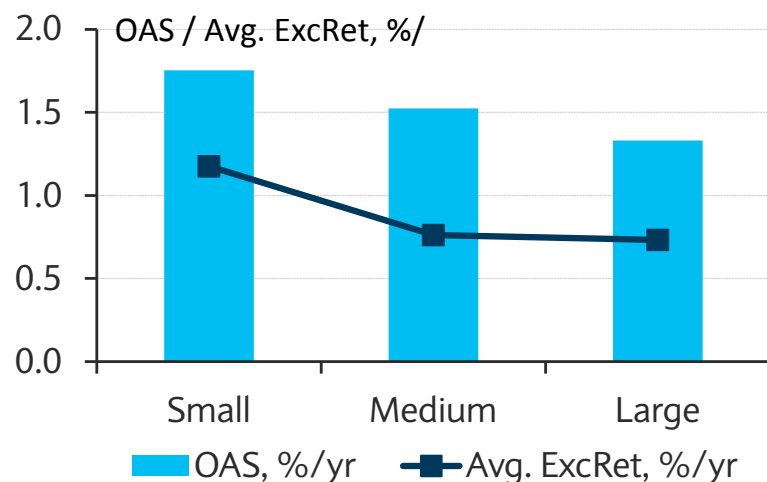
Source: Barclays Research

Spread and Performance by Size

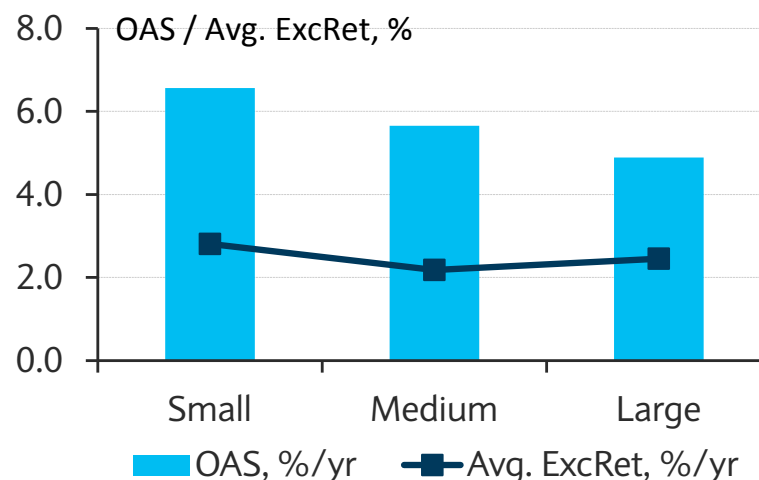
- Spread differences between Small and Large portfolios are comparable or larger than differences in returns
 - US IG Small-Large: 42bp for OAS vs 44bp for Avg. ExcRet
 - US HY Small-Large: 170bp for OAS vs 35bp for Avg. ExcRet
- What is the performance of Small vs Large issuer portfolios if we control for differences in spread?

Spread and Performance by Size, 1994 - 2018

US IG



US HY



Source: Barclays Research

SML Performance in Credit Ceteris Paribus

Does Issuer Size Affect Performance Other Things Equal?

- We contrast two Size portfolios with identical risk exposures
 - Small (minimize issuer Size) vs. Large (maximize issuer Size)
 - Closely match each-other's exposures and allocations
 - What is the relative performance of the exposure-matched Size portfolios?

Size Portfolios are Built to Match Exposures of the Bloomberg Barclays US Corporate Index

Aggregate Exposures

- OA spread
- Duration Times Spread (DTS)
- OA spread duration

By Sector / Maturity

- Market weights (8 x 2 = 16 buckets)
- DTS contribution
- OA spread duration

By Rating

- Market weights

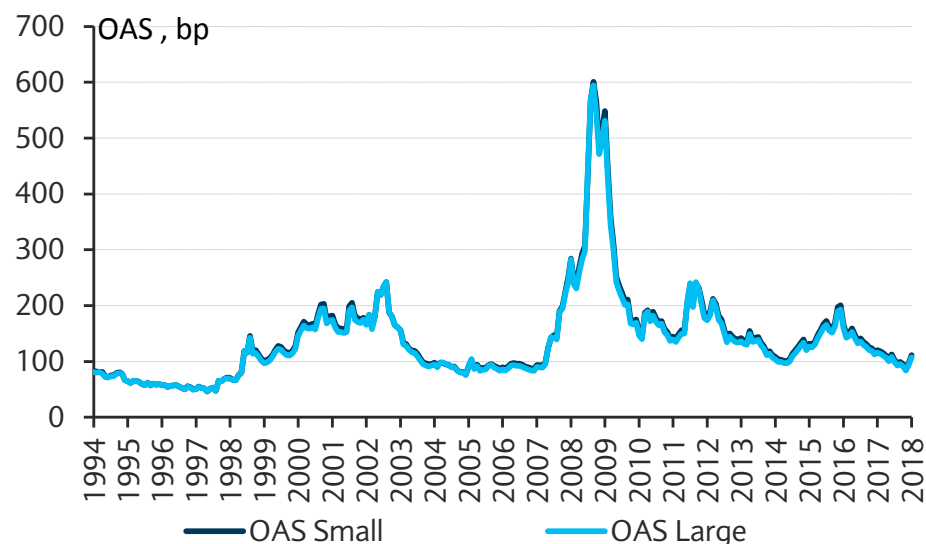
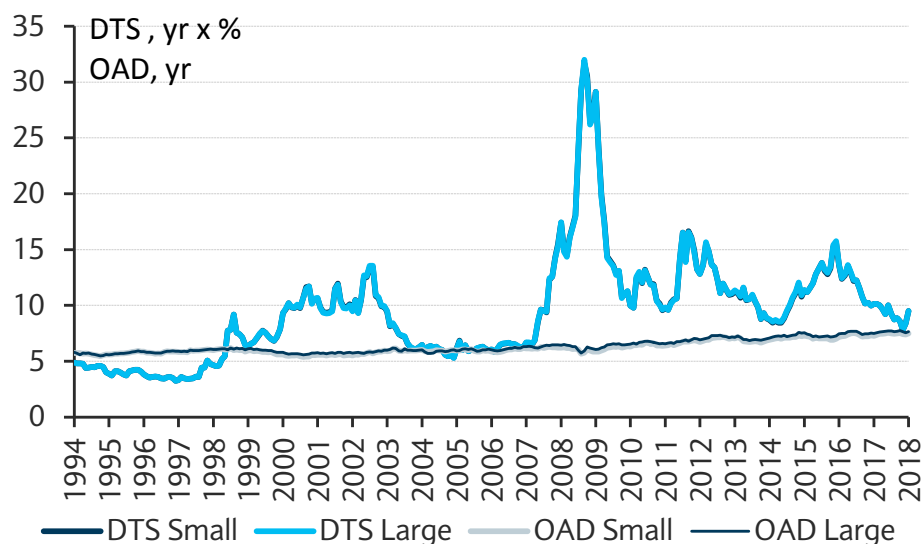
By Issuer / Issue

- Issuer market value concentration relative to index
- Issuer DTS concentration relative to index
- Issue market value concentration relative to index

Characteristics of Index Tracking Size Portfolios over Time

- Characteristics of Size portfolios are closely matched
 - OA Spread (OAS)
 - Duration Times Spread (DTS) = Credit Exposure
 - OA Duration (OAD)
- In addition, portfolios are matched by
 - Sector / maturity bucket allocation
 - Sector / maturity DTS and OAD contribution

Characteristics of Small and Large Issuer Size Portfolios Over Time



Source: Barclays Research

Size Portfolios Are Well Diversified

- Small and Large size portfolios are well diversified, consisting of about 400 bonds
 - Large Size portfolios include fewer issuers than Small size portfolios
 - There is a large difference in average issuer size between Small and Large size portfolios
- The performance difference between Small and Large size portfolios should be driven by issuer size as other major risk exposures are neutralised
 - => SML Factor in credit?

Composition of Issuer Size Portfolios by Period

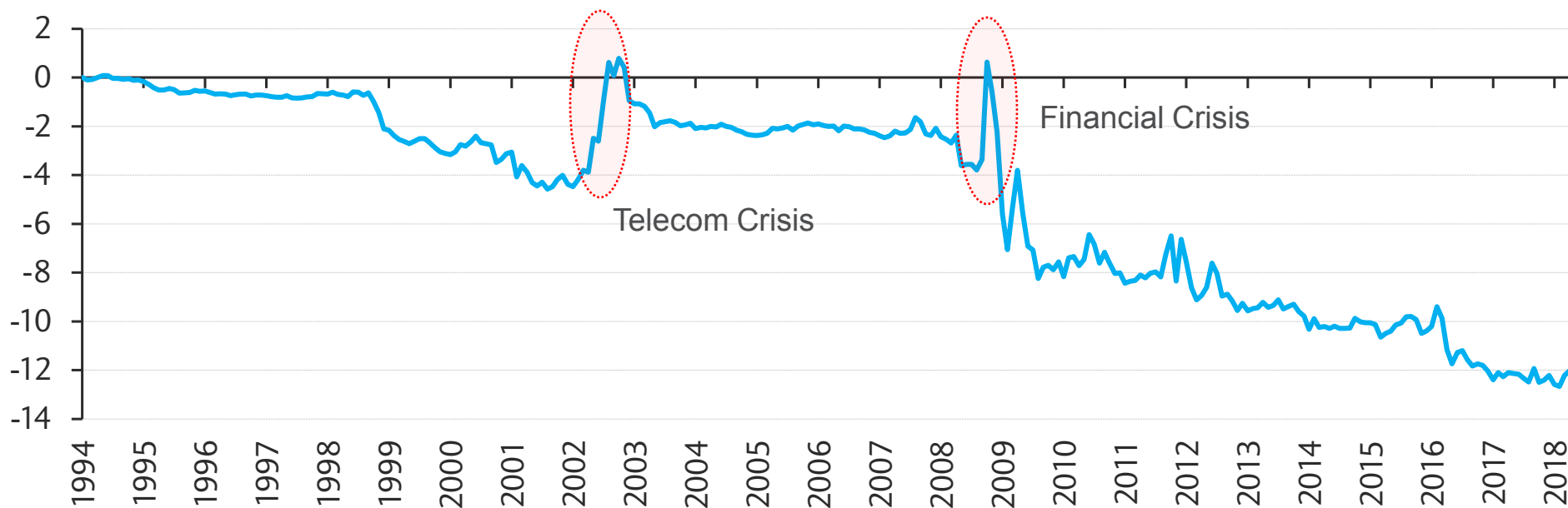
Period	# bonds		# issuers		Size in \$bn	
	Small	Large	Small	Large	Small	Large
1994-1998	477	393	297	106	0.27	1.30
1999-2003	506	376	335	116	0.42	3.13
2004-2008	486	369	307	121	0.77	4.08
2009-2013	531	399	319	130	0.91	5.06
2014-2018	573	420	348	139	0.89	5.89

Source: Barclays Research

Small is Not Always Beautiful...

- We plot cumulative performance of Small over Large size portfolios = “Small Minus Large (SML)”
- Small size portfolios have consistently underperformed except in 2002-2003 and 2008-2009
- Market liquidity was poor during these episodes, especially for smaller bonds
 - => Outperformance of Small size portfolios during market distresses in 2002 and 2008 can be related to difficulties in price discovery of smaller bonds
 - Implicitly confirmed by “quick reversals” after the crises
- On average, Small size portfolios underperformed Large Size portfolios by 50bp/yr

Cumulative Performance of Small over Large Size Portfolios in US IG Exposure Matched, 1994 - 2018



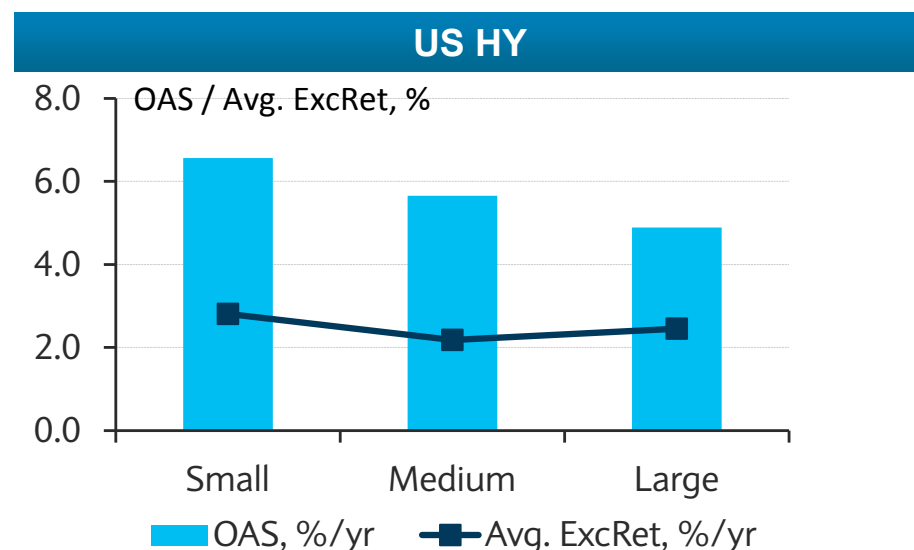
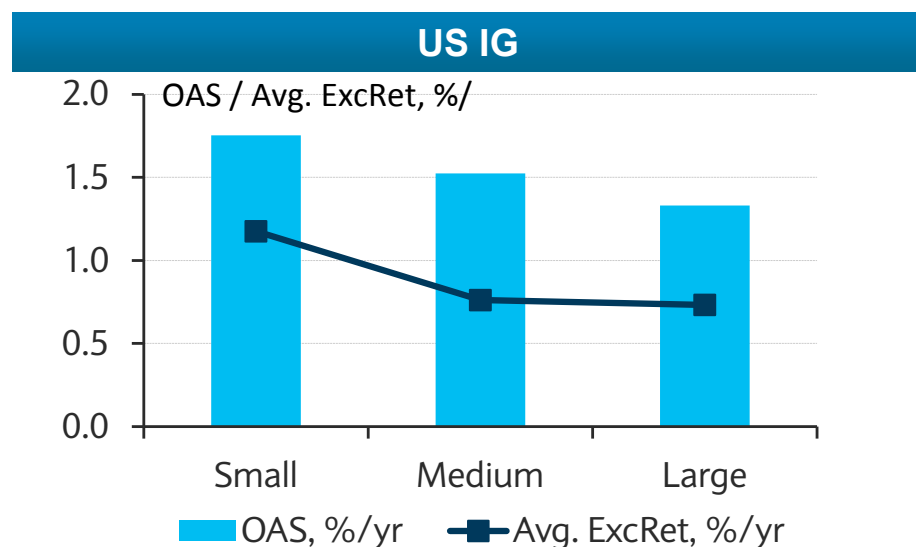
Source: Barclays Research

Estimating Issuer Size Spread Premium

Issuer Size Spread Premium

- It is not immediately clear whether spread differentials between Small (bottom 30%) and Large (top 30%) Size portfolios are attributed to Size or other characteristics, such as differences in sector and rating distributions, liquidity, and duration
- We design a statistical framework (similar to Fama-MacBeth regressions) to attribute the spreads to issuer's characteristics
- Each month we run a cross-sectional regression of issuer spreads on size, duration, sector and rating dummies
- Size is controlled by two dummies: Small (if in bottom 30%) and Large (if in top 30%)

Spread and Performance by Size, 1994 - 2018



Source: Barclays Research

Estimating Size Spread Premium – US IG

- Controlling for Rating: 21bp -> 9bp
- Controlling for Rating and Liquidity: 9bp -> 5bp = “Size Premium”

Explaining Issuer Spread in US IG, 30 April 2018

Category	Variable	Model 1 Coeff	t-stat	Model 2 Coeff	t-stat	Model 3 Coeff	t-stat
Size	Small	14.5	4.0	11.3	4.6	8.8	3.5
	Large	-6.9	-1.9	1.8	0.7	3.9	1.6
OAD	OAD	4.2	7.5	5.8	15.1	6.3	15.7
Sector	BAS	107	26.6	50	8.2	51	8.5
	CYC	110	20.3	59	9.2	59	9.4
	NCY	108	23.7	53	8.6	55	9.1
	COT	117	26.4	60	9.8	60	9.9
	TRE	140	31.0	71	11.6	73	11.9
	UTI	107	18.6	53	7.8	51	7.7
	BAB	103	21.0	70	11.5	74	12.1
	FIO	120	28.4	70	11.4	69	11.5
Rating	A1	-	-	10	1.4	11	1.5
	A2	-	-	14	2.3	13	2.2
	A3	-	-	30	5.1	29	5.0
	BAA1	-	-	46	7.7	45	7.6
	BAA2	-	-	62	10.7	60	10.7
	BAA3	-	-	91	15.8	91	15.9
Bid-Ask	Liquidity	-	-	-	-	1.3	3.8
	R-sq	25%		67%		68%	

Source: Bloomberg Barclays Indices, Barclays Research

Estimating Size Spread Premium – US HY

- Controlling for Rating: 111bp -> 41bp
- Controlling for Rating and Liquidity: 41bp -> 40bp = “Size Premium”

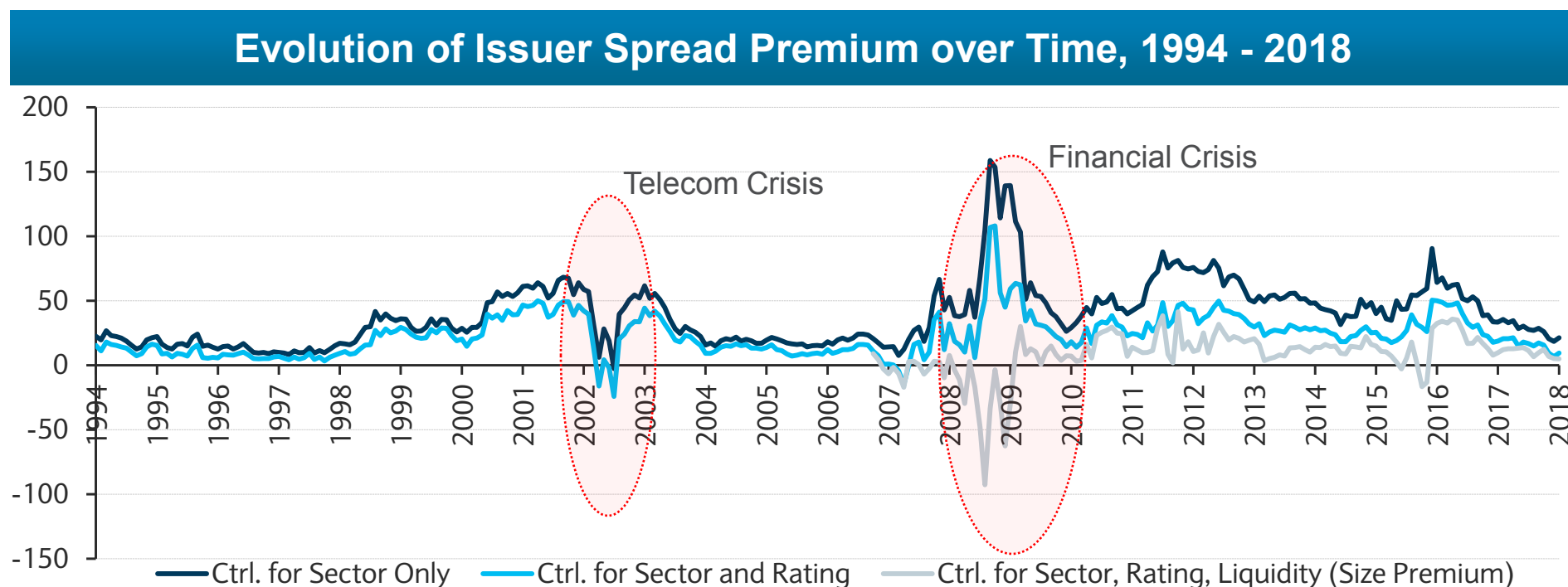
Explaining Issuer Spread in US HY, 30 April 2018

Category	Variable	Model 1		Model 2		Model 3	
		Coeff	t-stat	Coeff	t-stat	Coeff	t-stat
Size	Small	99.9	4.5	60.9	3.2	59.9	3.1
	Large	-10.9	-0.5	20.2	1.0	20.2	1.0
OAD	OAD	-7.1	-1.2	14.2	2.6	16.3	2.9
Sector	BAS	248	10.8	104	3.0	103	2.9
	CYC	301	13.1	167	4.6	165	4.6
	NCY	359	18.2	183	5.1	182	5.1
	UAE	377	16.1	215	5.8	214	5.8
	FIN	259	6.3	158	3.6	158	3.6
Rating	BA2	-	-	25	0.6	26	0.7
	BA3	-	-	35	0.9	38	1.0
	B1	-	-	58	1.5	61	1.6
	B2	-	-	132	3.7	134	3.7
	B3	-	-	187	5.0	190	5.1
	CCC and below	-	-	373	10.2	373	10.2
Bid-Ask	Liquidity	-	-	-	-	0.05	1.6
R-sq		8%		35%		35%	

Source: Bloomberg Barclays Indices, Barclays Research

Size Spread Premium over Time – US IG Market

- Repeating the analysis each month we can observe evolution of the Size spread premium over time
- When controlled for liquidity (Bid-Ask spread), the size spread premium becomes negative in 2008-2009

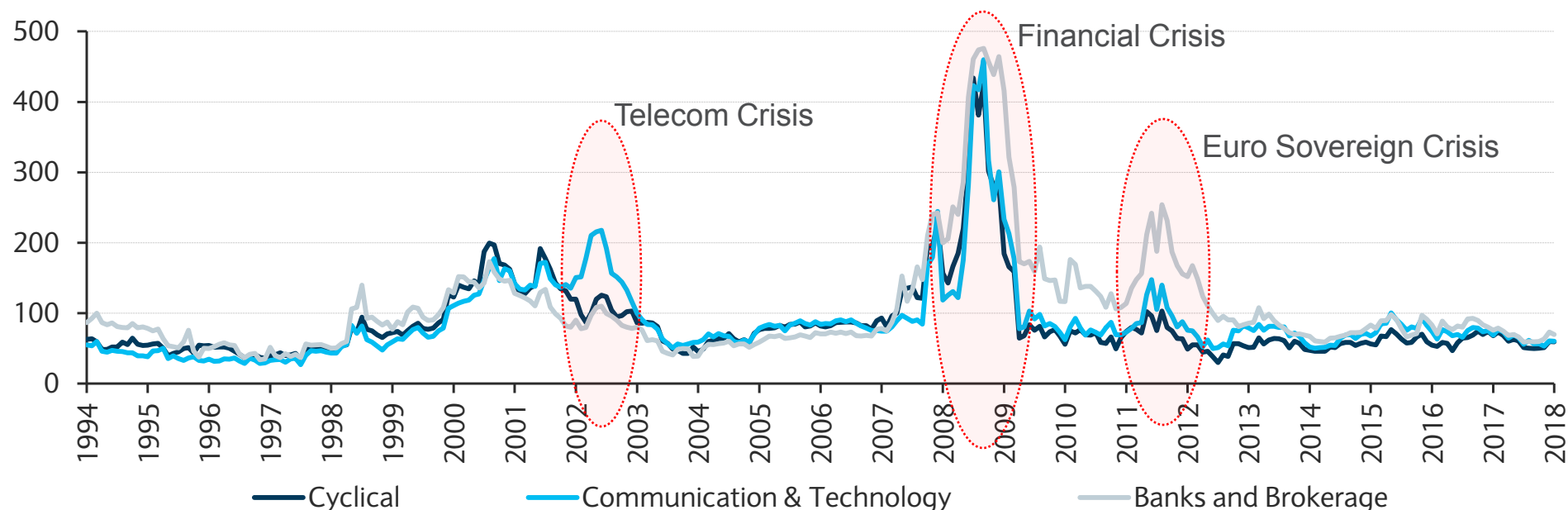


Source: Barclays Research

Sector Spread Premium over Time – US IG Market

- We also report the evolution of sector spread premia while controlling for other characteristics, such as rating, duration and size
- There are clear spikes in sector spreads associated with specific distress periods:
 - Telecom in 2002
 - Financial crisis in 2008
 - Euro sovereign crisis in 2011

Sector Spread Premium over Time, 1994 - 2018

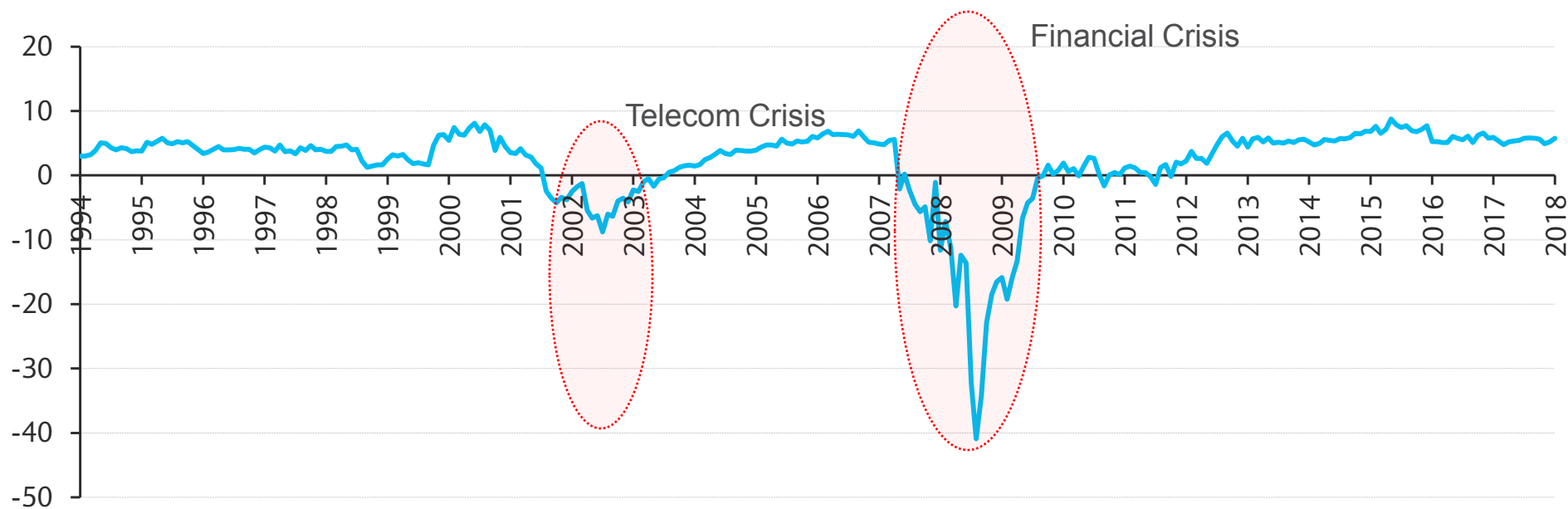


Source: Barclays Research

Duration Spread Premium over Time – US IG Market

- We report the evolution duration spread premium while controlling for other characteristics, such as sector, rating, and size
- There are clear episodes of spread curve inversion associated with distress environment:
 - Telecom in 2002-2003
 - Financial crisis in 2008-2009

Sector Spread Premium over Time, 1994 - 2018

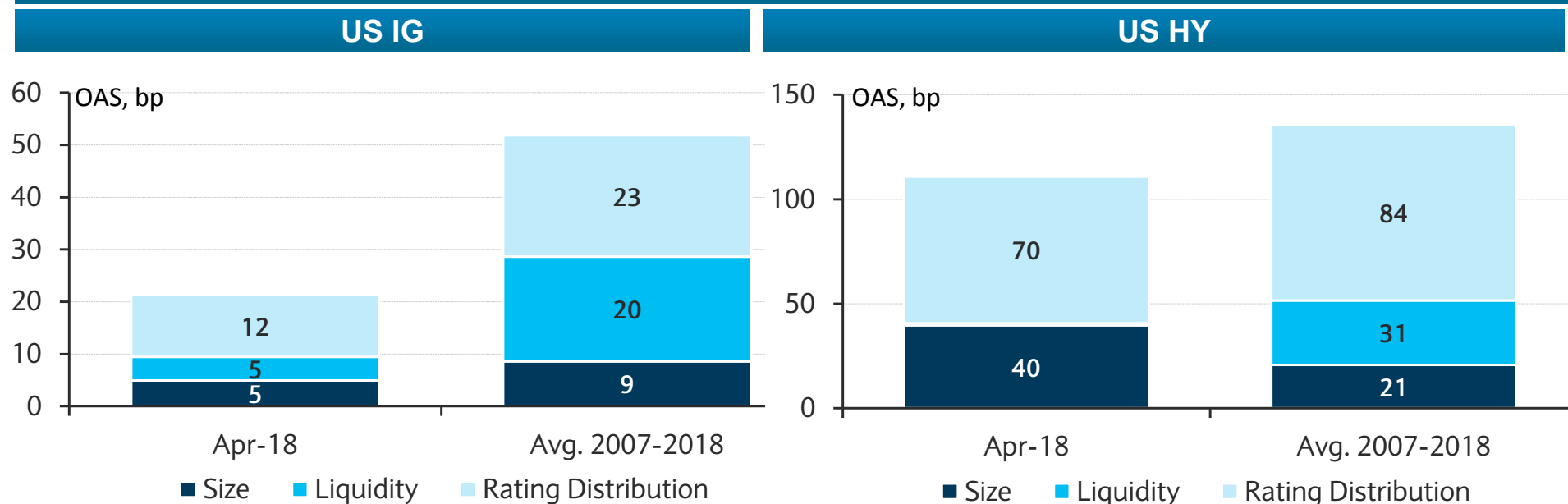


Source: Barclays Research

Spread Premium Attribution

- Regression analysis can help attribute the spread differences between Small and Large portfolios into:
 - Size
 - Differences in bond liquidity
 - Differences in rating quality
- Current Size premium: 5bp in US IG and 40bp in US HY
- Averages since 2007: 9bp and 21bp
- The current Size spread premium is small relative to the historical performance losses of -50bp/yr

Attributing Spread Difference Between Small and Large Size Issuers



Source: Barclays Research

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