Corporate Credit Spread Chartbook
Technology, Media, and Telecommunications

Morningstar Credit Research
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Contents

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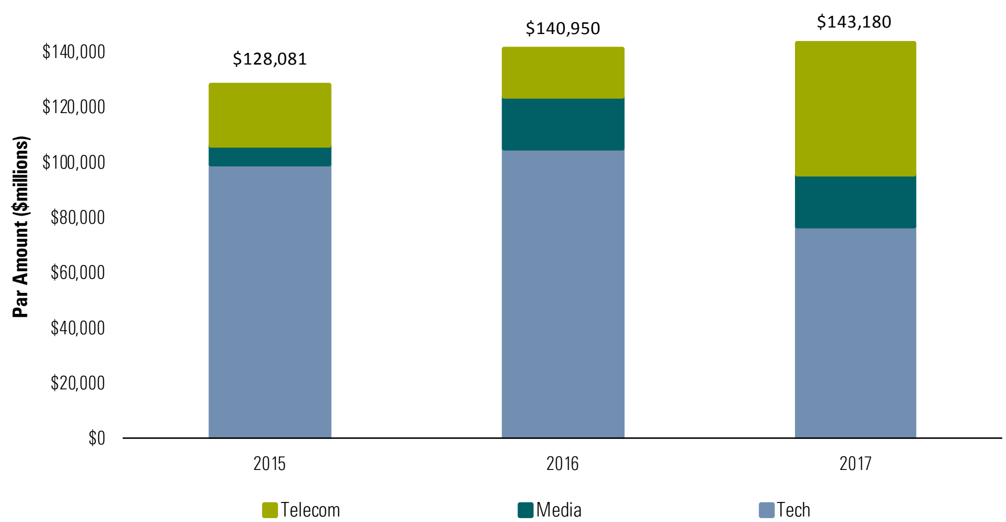
Executive Summary
For the 12 months ended Jan. 4, corporate spreads for the technology subsector of the Morningstar Corporate Bond Index tightened 23 basis points, lagging a 31-basis-point tightening in the overall index. Over the same period, media spreads tightened 27 basis points relative to the index despite high-profile merger activity in the sector, while telecommunication spreads tightened only 11 basis points, with performance muted by a high volume of debt issuance driven by acquisition funding. Since the most recent chartbook, published Sept. 11, we announced seven rating affirmations across the three subsectors and two rating downgrades of telecommunications companies, both related to announced acquisitions. Looking ahead, we expect technology operating performance to remain in line with recent trends, with moderate event risk. Recent tax reform creates uncertainty around future capital policy for global firms with substantial overseas cash. We also expect event risk to remain a key credit driver for the media and telecom sectors as issuers in these sectors explore convergence strategies to sustain growth and navigate increasingly disruptive operating environments.

Key Takeaways
- Total issuance in technology, media, and telecom for the full year was $143 billion, an increase of 1.6% from a year ago, led by a surge in telecom issuance.
- Credit trends remain stable in technology, with growth led by semiconductors, though event risk remains generally elevated for smaller issuers against a backdrop of ongoing industry consolidation.
- Media revenue growth has been slowing as a result of shrinking subscribers, and higher content costs are pressuring operating margins. Though leverage remains stable across the sector, payout ratios remain high. We expect increased pressure to negotiate access to new distribution channels for content, which we believe will continue to drive mergers and acquisitions activity.
- We expect credit metrics in the telecommunications sector to remain under pressure from large dividends, acquisitions, and heavy capital spending plans. In 2018, we expect to the focus to remain on event risk, including more interest in merging or partnering with technology and media companies to the extent that the regulatory environment is amenable to such arrangements.

New Issuance Activity

We estimate that issuance of investment-grade, U.S. dollar-denominated senior debt in tech, media, and telecom totaled $143.2 billion for the year through Dec. 31, 2017, up 1.6% year over year.

Exhibit 1 Investment-Grade TMT Issuance Volume



Source: Morningstar, Inc. Data shown through Jan. 4, 2018.

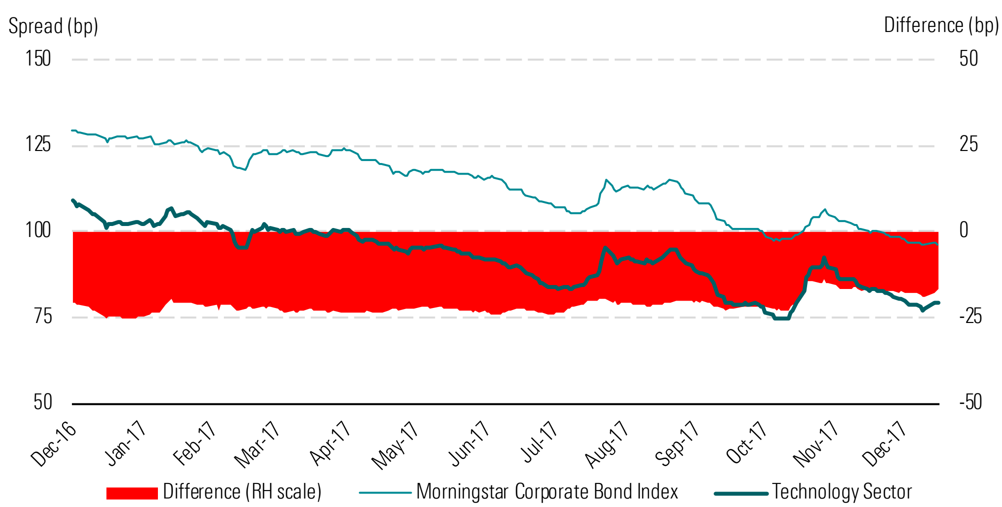
In contrast to recent years, which saw technology firms issuing the most debt, volume in 2017 was driven by telecom issuers. Debt issued by investment-grade telecom carriers increased 176% from 2016 to $47 billion, driven by $34.7 billion of U.S. dollar-denominated acquisition funding by AT&T Inc. (BBB-, stable) for the year. Technology issuance was down 27% from 2016, despite $30 billion of issuance from Apple Inc. (AA-, negative) and $10 billion from Oracle Corp. (AA-, stable) in 2017. Media issuance was unchanged from 2016, with issuance led by Discovery Communications' (BBB/UR-) $6.3 billion merger-driven debt issuance in September and $5 billion of issuance from Comcast Corp. (A-, stable).

The U.S. Senate/House compromise tax reform bill was signed into law Dec. 22 with the provisions of the law effective Jan. 1, 2018. The reform measures include a 15.5% tax on cash foreign undistributed earnings, which we believe may result in more cash being returned to the United States from foreign domiciles as well as near-term earnings headwinds from the higher tax expense. Technology is among the industry sectors potentially most affected by the provision, particularly for Apple and Microsoft Corp. (AA+, stable). Once companies pay the one-time tax, the aftertax status will afford much more flexibility in using the cash to fund a variety of activities, including domestic acquisitions, though the longer-term impact on corporate capital policies remains uncertain.

Historical Sector Spreads: Technology

Over the most recent 12 months, the technology component of the Morningstar Corporate Bond Index is 17 basis points tighter than the broader index, still reflecting a higher average credit quality. The differential narrowed an additional 8 basis points in 2017, with the sector slightly underperforming the broader corporate market. For the full year, the technology index produced a 6.1% total return compared with 6.4% for the overall index. We attribute the underperformance to ongoing new issue supply in high-profile names. Tech companies issued $77 billion in 2017, including $17.8 billion in the fourth quarter, substantially composed of $7 billion of issuance by Apple and $10 billion by Oracle. Over the next few months, we expect issuance from Cisco Systems (AA, stable), Intel Corp. (AA-, stable) and International Business Machines (A+, negative), based on their near-term maturity schedules. However, the recently enacted U.S. tax reform legislation, including a mandatory repatriation tax of 15.5% on foreign cash, may cause these companies to reposition cash to repay debt, leading to lower debt issuance in 2018. We expect to learn more about management teams' plans around the new tax law in upcoming earnings reports.

Exhibit 2 Morningstar Corporate Bond Index vs. Technology Sector (Trailing 12 Months)

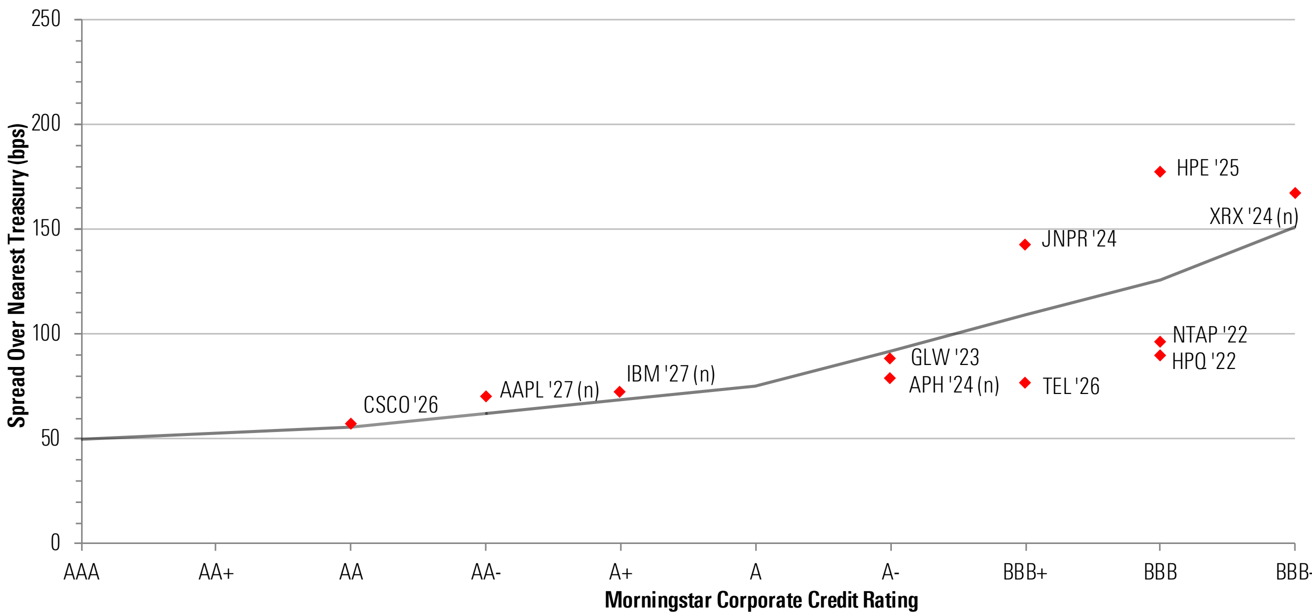


Source: Morningstar, Inc. Data as of Jan. 4, 2018.

Sector Spread Charts: Technology

Hardware

Exhibit 3 Technology Hardware vs. Morningstar Corporate Bond Index



Source: Morningstar Credit Ratings, LLC, Morningstar Inc., and Interactive Data. Data as of Jan. 4, 2018.
UR = rating under review / (p) = positive outlook / (n) = negative outlook

Credit Trends

After weakening throughout the first half of 2016, technology hardware revenue performance has since been improving modestly. Average revenue for our coverage base, which includes Apple, grew 2.2% in the calendar third quarter from a year ago, compared with 1.6% through the end of the previous quarter. Within this average, companies with high legacy product exposure once again saw a slight net revenue decline of 0.4%, though also improved from last quarter. As in prior quarters this year, hardware firms' use of debt remains at the high end of the technology sector at 2.3 times EBITDA, higher from a year ago by about 0.3 turn. Net cash after subtracting debt ended the period at 0.1 times, also worse from a year ago.

We still expect the secular decline in hardware revenue to continue as systems applications formerly dependent on physical equipment will increasingly be replicated by server-based software, which is likely to compress operating profitability of traditional hardware. Also, although payouts have moderated from last year, capital allocation remains more aggressive among hardware firms compared with the other tech segments, with average payout in the most recent quarter at 91% of trailing 12-month free cash flow.

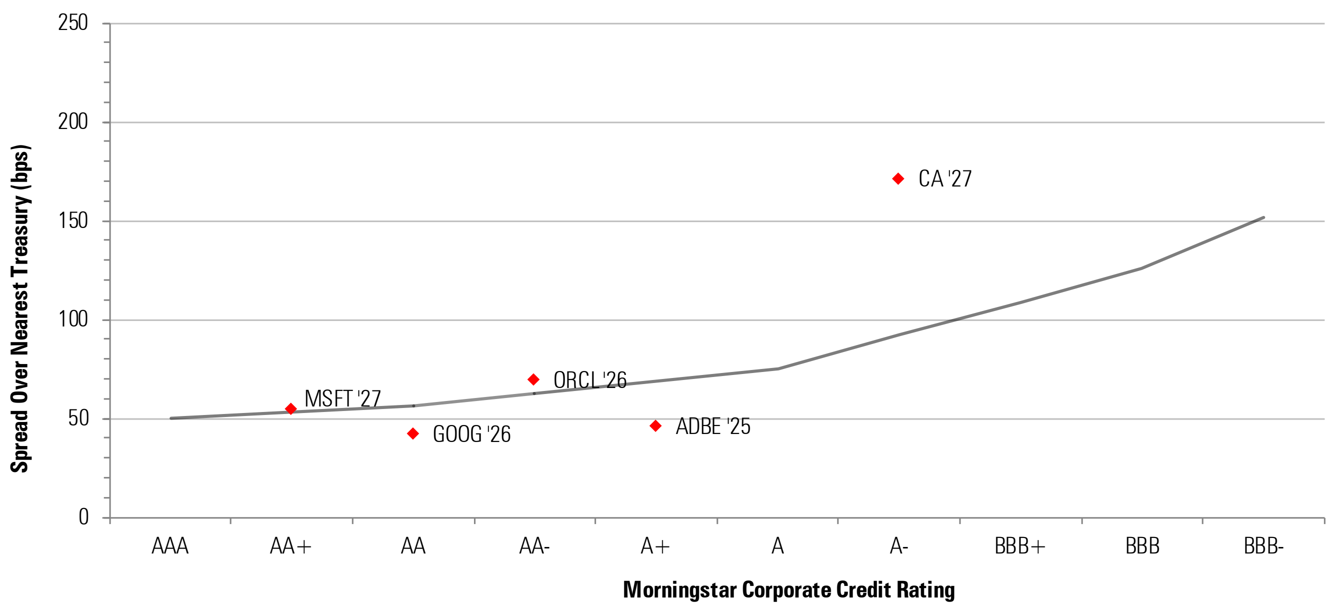
Issuer Highlights

Apple Inc.: On Nov. 6, Apple completed a $7 billion issue of senior notes, its fifth U.S. dollar offering in 2017. Apple has relied heavily on the credit markets to maintain its domestic cash reserves to fund its massive $300 billion capital return plan. Over the past 12 months, Apple's payout was 88% of its global free cash flow, higher relative to its technology peers, which has been largely funded with debt to offset the lack of domestically generated cash flow. Apple has not yet indicated if the lower repatriation tax on non-U.S. cash holdings will result in a material change to its future capital allocation strategy. Our AA- rating reflects Apple's moderate Business Risk and its strong Solvency and Cash Flow Cushion rankings, which are supported by high returns on invested capital and $252 billion of overseas cash and investments. Our negative outlook considers our view that Apple's credit picture remains clouded by slowing growth and profitability and the high revenue contribution of the iPhone.

- **International Business Machines Corp.**: We affirmed our A+ credit rating on Dec. 11, but our outlook remains negative. The rating reflects IBM's moderate Business Risk and Solvency Score and moderately weak Cash Flow Cushion as the company pivots its portfolio away from legacy hardware-driven solutions to software-defined distributed computing environments. Our rating assumes that IBM's revenue growth will gradually improve as its revenue mix continues to shift toward higher-growth areas. We also project a gradual expansion in operating margin between now and 2021.
- **Juniper Networks** (BBB+, stable): On Dec. 11, we affirmed our BBB+ credit rating on Juniper and maintained a stable outlook. Our rating reflects the highly competitive landscape for network equipment providers and the drawdown of domestic cash reserves and higher debt in the wake of Juniper's 2014-15 battle with activists. Though the Cash Flow Cushion rank is unchanged from the prior review, the cushion has improved as the result of a more optimistic cash flow forecast and a decrease in financial obligations. Our rating also considers the trend toward lower returns on invested capital, which has put modest pressure on the Solvency Score. The competitive landscape in routing and switching remains intense, which we believe may drive weaker margins for Juniper. We view Juniper's Business Risk as moderately high as the networking equipment industry continues to consolidate.
- **Xerox Corp.** (BBB-, negative): We affirmed our BBB- credit rating on Dec. 14 and maintain a negative outlook. Our corporate credit rating reflects the company's moderate Business Risk and weak Cash Flow Cushion and Solvency Score pillars. The rise of digital software and mobile computing has sharply reduced the need for producing physical documents, resulting in a slow, secular decline in Xerox's revenue. Following last year's spin-off of business process outsourcing, Xerox management is now focused on maintaining its higher-margin market-leading positions in core printing products, such as A3 MFP, while it invests and improves its competitive position in faster-growing opportunities. The negative outlook incorporates potential event risk and expectations for high competitive intensity and markets facing long-term secular decline in demand.

Software

Exhibit 4 Software vs. Morningstar Corporate Bond Index



Source: Morningstar Credit Ratings, LLC, Morningstar Inc., and Interactive Data. Data as of Jan. 4, 2018.
UR = rating under review / (p) = positive outlook / (n) = negative outlook

Credit Trends

During the most recent quarter, the average trailing 12-month revenue growth for the five software firms in our coverage increased 12.4%, though most of this performance was attributable to high growth from two cloud software firms. Excluding cloud-centric issuers, legacy enterprise software firms averaged 5% growth in revenue, marking sequential improvement from 2.5% comparable growth last quarter. Over the same period, trailing 12-month average margin improved 40 basis points from last quarter, averaging 36.1%.

Total debt for the software segment remains elevated at 1.8 times in the calendar third quarter, up slightly from a year ago. However, net cash for the group ended the quarter a bit stronger at just under 1.4 times EBITDA, which we attribute to stronger free cash flow and lower shareholder payout ratios. The volume of shareholder payout declined in the latest quarter to 39% of trailing four-quarter free cash flow compared with 73% a year ago. As with global hardware manufacturers, the lower tax on repatriation may reduce incentives to leverage domestic cash reserves if foreign cash holdings can be repatriated more flexibly.

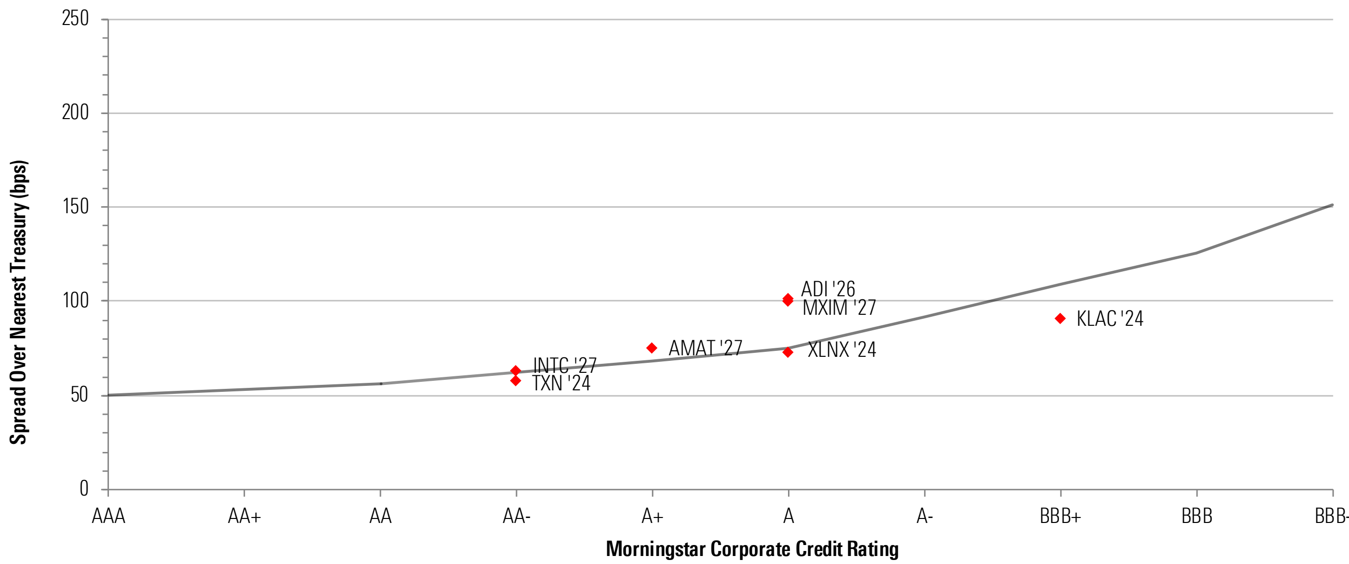
Like hardware firms, the traditional ownership model of product delivery for software firms has been declining in favor of alternative delivery methods. Legacy software companies are now contending with a market increasingly crowded with new entrants as the industry moves inexorably toward Internet-based (cloud) software delivery. Despite these headwinds, we believe the major investment-grade enterprise software providers continue to benefit from sustainable competitive advantages, supported by large installed bases of products with high switching costs and a high proportion of recurring income. Favorable margin and cash flow generation should provide time and flexibility for legacy developers to invest in emerging technologies. For firms that adapt to the changing landscape, we expect growth to pick up over the next decade compared with the slow decline in revenue from legacy software products.

Issuer Highlights

- **Microsoft Corp.**: We affirmed our AA+ rating on Dec. 22, maintaining a stable outlook. Our rating continues to reflect Microsoft's solid credit pillars. Business Risk remains strong, mitigating a modest weakening in the Cash Flow Cushion on higher debt maturities that are only partially offset by growth in projected cash flow. The Solvency Score remained stable and Distance to Default improved on strong equity performance. We believe Microsoft remains positioned to generate significant recurring revenue and stable margins, which should support solid cash flow. Though increases in mobile, server-based distributed computing and web-based applications threaten the traditional PC operating system, we also believe Microsoft should continue to benefit from its powerful network effect around its core products, giving it time to build share in new platforms. In the years ahead, we expect growth to be driven by continued rapid growth in Azure, LinkedIn, and Office 365, offset by ongoing decline in legacy products.
- **Oracle**: On Nov. 7, Oracle placed $10 billion of new senior notes, which we expect to be partially applied to repay $4.8 billion of short-term maturities. On Dec. 17, Oracle announced the $1.2 billion acquisition of cloud software-maker Aconex, marking its first acquisition since it acquired NetSuite in November 2016. Aconex is based in Australia and specializes in construction project collaboration platforms, a focus that should fit well with Oracle's 2016 acquisition of U.S.-based construction project management software firm Textura. Both acquisitions are consistent with Oracle's focus on developing deeper industry-specific products through niche portfolio acquisitions. Our AA- rating reflects Oracle's strong market share, cash flow generation, and financial flexibility, which supports a solid Business Risk and Solvency Score. However, the Cash Flow Cushion remains under pressure from higher debt to fund acquisitions. Our outlook remains stable.

Semiconductors

Exhibit 5 Semiconductors vs. Morningstar Corporate Bond Index



Source: Morningstar Credit Ratings, LLC, Morningstar Inc., and Interactive Data. Data as of Jan. 4, 2018.
UR = rating under review / (p) = positive outlook / (n) = negative outlook

Credit Trends

Semiconductor firms continued to gain revenue momentum as the industry rebounds from a challenging 2016. However, we continue to view event risk as elevated for smaller firms as the trend toward industry consolidation has shown signs of persisting, most recently evidenced by a Nov. 6 hostile bid by Broadcom Limited (not rated) for Qualcomm (not rated). For the calendar third quarter of 2017, we estimate core revenue growth for the semiconductor issuers under our coverage averaged around 7% for the trailing four quarters, compared with flat growth a year ago. This excludes growth of wafer fabrication equipment manufacturers, which saw revenue grow a brisk 55% over the trailing period compared with 12% a year ago on the confluence of strong order flows in 3-D NAND memory, logic production growth, and OLED video display technology. EBITDA margin for semiconductors averaged 37% during the period, slightly higher from a year ago.

Average debt/trailing four-quarter EBITDA for the semiconductor firms we cover ended the quarter at 2.0 times, up a quarter turn from a year ago. However, excluding the impact of Analog Devices (A, stable), which acquired Linear Technology in March, the sector's total debt was 1.5 times EBITDA, down slightly from last year. Semiconductors reported an average balance of excess cash over debt of 0.6 times EBITDA, excluding Analog Devices, slightly higher from a year ago.

World Semiconductor Trade Statistics now expects revenue growth to come in at 20.6% for full-year 2017, compared with modest growth of 1.1% in 2016. For 2018, it projects growth slowing to 7%, once again led by memory and sensors.

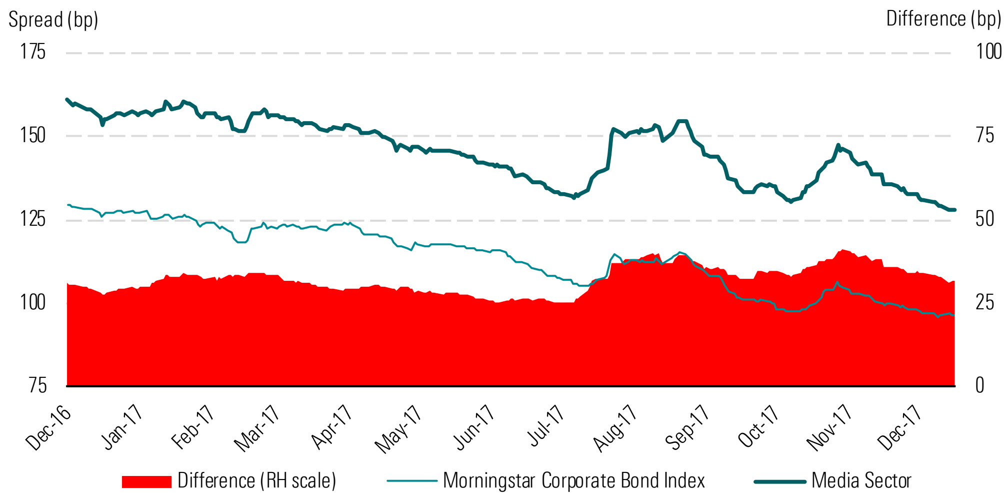
Issuer Highlights

- **Analog Devices**: 2017 marked a transformative year for ADI as the company completed its merger with Linear Technology. Since the merger closed in the first half, revenue growth has remained in the midsingle digits and operating margin has improved thanks to accretion from Linear's portfolio. Our A credit rating reflects the impact of the Linear merger, which added $7.1 billion of new debt and weakened the company's once-robust Cash Flow Cushion. The Solvency Score also declined by a notch as a result of lower projected returns on invested capital caused by higher goodwill and intangibles. Over time, we think this impact should be partially offset by cost savings. We expect the addition of Linear's high-margin product portfolio to complement Analog Devices' leading market share in signal conversion circuitry, allowing the combined company to operate in an expanded market for its products.
- **Maxim Integrated Products.** (A, stable): Revenue has improved steadily throughout the last four quarter, supported by strength in automotive and industrial end markets. Higher revenue and a reduction of manufacturing costs also contributed to stronger operating margin over the period. Though total debt has increased year over year, net cash has improved on a 24% increase in free cash flow. Our A credit rating and stable outlook reflect Maxim's steady Business Risk as well as an improving Solvency Score due to better returns on invested capital. Despite recent performance improvement, we believe uncertainty in Business Risk persists as Maxim has high exposure to short-cycle consumer products relative to its peers, though we expect the company to continue to make progress toward increasing end-market diversity. We also still consider event risk elevated amid broader industry consolidation.
- **Xilinx Corp.** (A, stable): Strong demand from sales to automotive and industrial supported Xilinx's September-quarter results, offsetting order volume weakness in telecommunications and data centers. However, despite a stable gross margin, higher operating costs put modest pressure on operating margins relative to a year ago. Our A rating on Xilinx reflects a moderate and stable Business Risk score and a strong Solvency Score, supported by high returns on invested capital and low debt. Morningstar's Equity Research Group assigns Xilinx a narrow economic moat rating, supported by high switching costs for engineering and training faced by customers if they change vendors. While revenue has historically exhibited cyclicality, we view this as mitigated by Xilinx's relatively low capital needs, maintenance of solid cash reserves, and historically conservative debt levels. Total debt is now close to 2.1 times EBITDA, up modestly in recent years as a result of a slowdown in operating performance during 2016. However, liquidity remains well supported by a substantial amount of cash reserves in excess of debt. Despite a lower free cash flow trajectory, management increased its payout to shareholders over the past year, driving a modest increase in leverage. We expect event risk to remain elevated amid general consolidation in the semiconductor industry, though our outlook on Xilinx remains stable.

Historical Sector Spreads: Media

Media spreads are now 32 basis points wider than the Morningstar Corporate Bond Index, with the differential 3 basis points wider over the past 12 months. However, the media index has slightly outperformed the corporate index on a total-return basis, returning 7.6% compared with 6.4% for corporates, an incongruity that we attribute to the higher average coupon of the media constituents relative to the broader market. New issue volume in the sector was quiet in the fourth quarter, with only $900 million of notes issued by CBS Corp. (BBB, stable). Over the next quarter or so, we expect additional issuance from Comcast and Walt Disney Co. (A+, stable) and a possible return to the market by Interpublic Group of Companies (BBB, stable), based on short-term debt maturity schedules as of Sept. 30.

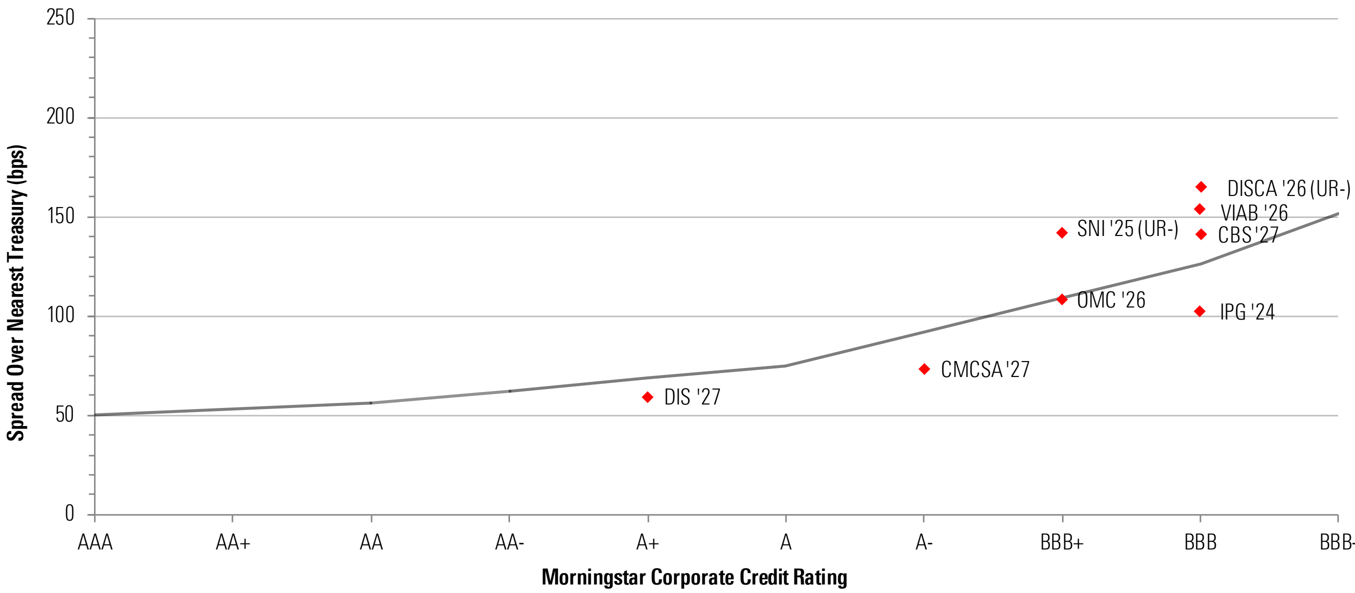
Exhibit 6 Morningstar Corporate Bond Index vs. Media Sector (Trailing 12 Months)



Source: Morningstar, Inc. Data as of Jan. 4, 2018.

Sector Spread Charts: Media

Exhibit 7 Media vs. Morningstar Corporate Bond Index



Source: Morningstar Credit Ratings, LLC, Morningstar Inc., and Interactive Data. Data as of Jan. 4, 2018.
UR = rating under review / (p) = positive outlook / (n) = negative outlook

Credit Trends

As we expected, mergers and acquisitions remained a key theme during the fourth quarter. On Nov. 20, the U.S. Department of Justice filed a lawsuit to block the proposed merger of Time Warner Inc. (not rated) and AT&T, raising doubt throughout the industry. Notwithstanding the increased antitrust scrutiny in media, Walt Disney announced a $52.4 billion merger with Twenty-First Century Fox Inc. (not rated) for the majority of Fox's film and cable assets and its ownership of British pay-TV service Sky PLC (not rated).

In the first quarter of calendar 2018, we expect the Time Warner merger proposal to remain a news driver as the case is heard by the U.S. Circuit Court. We would not be surprised to see Disney's merger with Fox attract some political scrutiny, given its size and the collective market share of the two companies in film and television. Meanwhile, we expect growth in streaming video customers to remain a closely watched indicator as established media players test the depth and sustainability of consumer appetites for online viewing. Over time, cost control may become more of a differentiating factor as content providers work to maintain a brisk pace of new content releases to attract and retain viewers amid a growing array of alternatives.

Media revenue growth has been slowing from shrinking pay-TV subscribers, and operating margins have contracted as content costs have risen as opportunities to stream video via the Internet are proliferating. This has shifted the balance of power away from the cable distributors to content providers, which have become increasingly in demand as acquisition targets. Though leverage remains stable across the sector, payout ratios remain high. We expect increased pressure to negotiate access to new distribution channels for content, which we believe will continue to drive merger and acquisition activity. We generally expect distribution and retransmission fees to continue to grow at midsingle digits for major content providers as nascent distribution channels continue to spring up and create incremental demand for content.

Revenue growth for the trailing 12 months improved sequentially to 5.1%, with strong contribution from distribution fees, while operating margin improved modestly. Average net debt declined slightly over the period, ending the calendar third quarter at 2.2 times trailing EBITDA compared with 2.3 times a year ago. Despite generally solid cash flow generation, we view shareholder payouts as high for most companies in the sector, averaging 122% of free cash flow over the most recent four quarters compared with 95% a year ago.

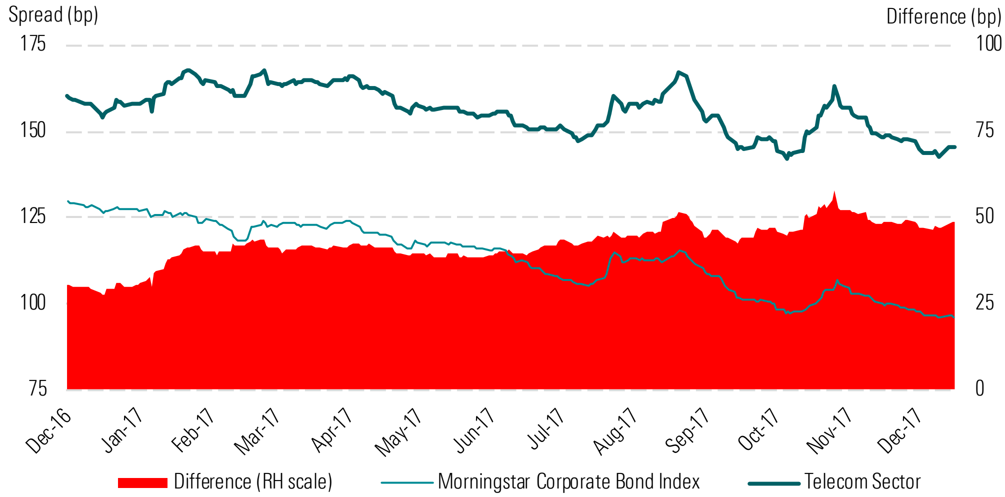
Issuer Highlights

- **Walt Disney**: On Dec. 14, following weeks of market speculation, Disney announced an agreement to acquire certain assets from Twenty-First Century Fox. Disney agreed to pay equity consideration of $52.4 billion and the assumption of as much as $21 billion of net debt in exchange for assets representing about 60% of Fox's consolidated EBITDA. We believe the use of 100% common stock to fund the purchase and the strong cash flow of the acquired assets appears sufficient to substantially offset the negative credit impact of higher pro forma debt. In accordance with our expectation that Disney will remain solidly positioned in the A+ category, While we do not currently anticipate that the merger will affect the credit rating, we may revise either the rating or the outlook in the future in the event of material adverse changes in the proposed merger terms, payment of termination penalties, or a material deterioration in the operating performance of Disney, Fox, or any related parties that we would deem to materially affect the pro forma credit strength of the combined companies. Disney anticipates the merger being completed in 12-18 months. If the merger is successful, we project Disney's EBITDA increasing from $16.7 billion in fiscal 2017 to $21 billion by year-end 2019 (before synergies), inclusive of Fox and its minority interest in Sky PLC (not rated). If Fox is successful in acquiring the balance of Sky, then we estimate Disney will gain an additional $2.5 billion of EBITDA. Including Fox and 100% of Sky, we calculate that Disney's net debt/EBITDA may initially rise on a presynergy basis toward 1.8 times from 1.3 times for the 12-month period ended Sept. 30. Disney management has guided to $2 billion of annual operating synergies to be fully realized by 2021. Including the full amount of synergies, we believe net leverage could settle sustainably below 1.5 times within our five-year forecast horizon.

Historical Sector Spreads: Telecommunications

Over the past 12 months through Jan. 4, the telecommunications index tightened 11 basis points. As a result, the sector is now 49 basis points wide to the Morningstar Corporate Bond Index, with the differential 20 basis points wider for the period. In 2017, telecom issuers placed $47 billion of new notes, led by AT&T with $35 billion of issuance. However, the telecom sector returned just under 7% during the year, compared with a total return of 6.4% for the Morningstar Corporate Bond Index. We attribute the higher returns to the higher coupons on telecom notes relative to the broader market, which more than compensated for the weaker pace of spread tightening.

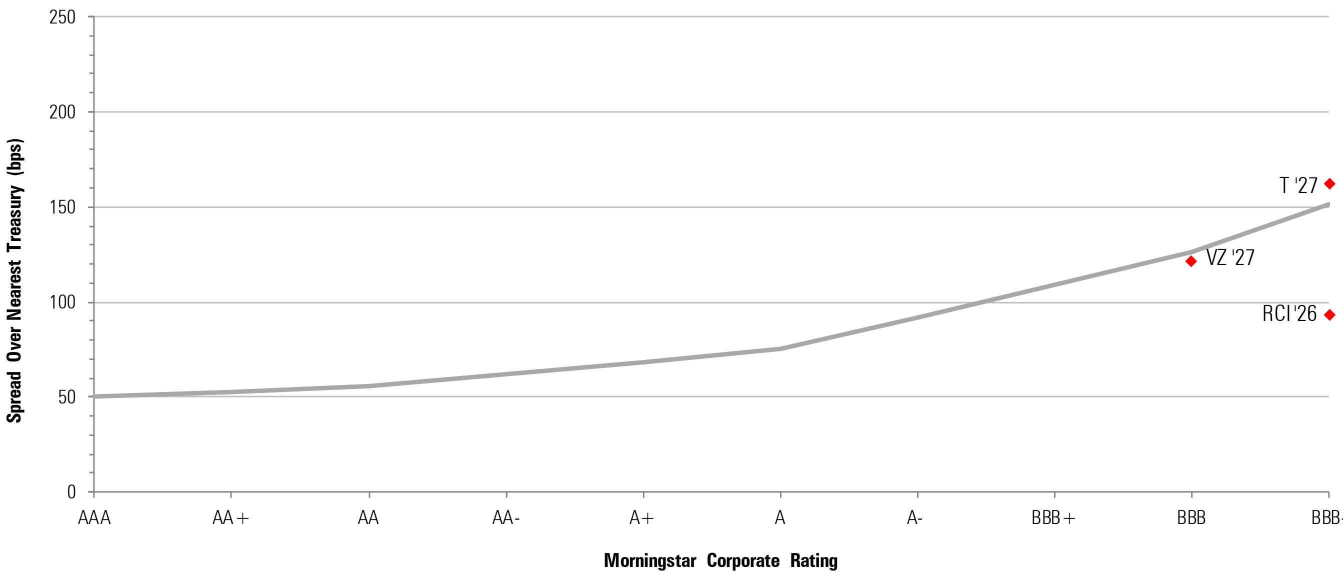
Exhibit 8 Morningstar Corporate Bond Index vs. Telecommunications Sector (Trailing 12 Months)



Source: Morningstar, Inc. Data as of Jan. 4, 2018.

Sector Spread Chart: Telecommunications

Exhibit 9 Telecommunications vs. Morningstar Corporate Bond Index



Source: Morningstar Credit Ratings, LLC, Morningstar Inc., and Interactive Data. Data as of Jan. 4, 2018.
UR = rating under review / (p) = positive outlook / (n) = negative outlook

Credit Trends

We believe the credit profiles of telecommunications issuers will remain under pressure thanks to large dividend commitments, strategic acquisitions, and heavy capital spending plans. Wireless revenue continues to slow as penetration rates in the U.S. are already well above 100% (according to data from industry trade group CTIA) and indicate that most people who want a mobile device probably already have at least one. As with media, the key theme for telecommunications remains mergers and acquisitions as telecom companies look to acquire media properties and develop ancillary products to offer wireless customers to generate more recurring revenue.

In the quarter ahead, we believe the credit profiles of telecommunications issuers will remain under pressure thanks to large dividend commitments, strategic acquisitions, and the pressure to invest heavily in network expansion and improvement. The change in tone in Washington has also removed the pressure on carriers to abide by strict net neutrality regulations, which may allow carriers to exempt certain data consumption from data caps in exchange for lower download speeds on those streams. This benefits carriers like AT&T, which could exempt all DirecTV Now viewing from its high-speed data limits, giving it a competitive advantage over carriers that do not offer similar services. Longer term, we expect significant capital spending on network upgrades and eventually the rollout of 5G technology.

Issuer Highlights

- **AT&T**: Morningstar Credit Ratings, LLC had downgraded AT&T to BBB- with a stable outlook on Oct. 31 in anticipation of the merger being completed by year-end 2017. On Nov. 20, the U.S. Department of Justice filed a lawsuit in U.S. District Court to block the merger of AT&T and Time Warner. We did not take any rating action based on this announcement as we believe the pending litigation involves uncertainty around costs and the potential for management attention to be diverted from core operations toward what may be a prolonged legal battle, which may affect AT&T's credit profile. If the merger fails to close, we may consider restoring AT&T's rating to BBB, though this would depend heavily on our assessment of the outlook for its financial strength and operating condition at that time. AT&T and Time Warner have extended the merger termination date to April 2018 to accommodate the legal process around the DOJ's lawsuit.
- **Verizon Communications** (BBB, stable): On Nov. 29, Verizon announced plans to launch a pilot program to offer fixed broadband access in three to five U.S. markets by year-end 2018, beginning with Sacramento, California, in the second half of the year. With its core wireless and fixed-line businesses at or approaching maturity, Verizon's management is focused on upgrading its network in preparation for the next wireless evolution. If successful at commercial scale, investment in 5G fixed wireless broadband technology should improve Verizon's ability to offer competitive data service to more strongly compete with cable operators in certain markets. However, the economic advantage of 5G fixed wireless broadband to the highest-value customers relative to traditional fixed-line networks remains uncertain, as does the cost to develop and implement 5G technology and the ultimate expected return on investment for the carrier in what is likely to be a highly competitive environment. Following its initial phase of testing, Verizon found that the high-frequency millimeter-wave spectrum it has been testing showed better propagation characteristics than expected, and the range for high-bandwidth transmission speeds was longer than expected. The test results appear to indicate stronger signal propagation of the higher-frequency spectrum over longer distances than expected, which may reduce the cost of implementation. However, we believe that significant performance challenges still exist in rolling out 5G technology at scale, under high-utilization data loads.

Exhibit 10 Morningstar Credit Ratings Sector Coverage: Technology, Media, and Telecommunications

Issuer	Ticker	Corporate Rating	Rating Outlook	Moat*	Moat Trend*	Uncertainty*
Hardware						
Cisco Systems	CSCO	AA	Stable	Narrow	Stable	Medium
Apple	AAPL	AA-	Negative	Narrow	Positive	High
International Business Machines	IBM	A+	Negative	Narrow	Negative	High
Amphenol	APH	A-	Negative	Narrow	Stable	Medium
Corning	GLW	A-	Stable	Narrow	Stable	High
HP Inc.	HPQ	BBB	Stable	None	Negative	High
Hewlett Packard Enterprise	HPE	BBB	Stable	None	Negative	High
Juniper Networks	JNPR	BBB+	Stable	Narrow	Negative	High
NetApp	NTAP	BBB	Stable	None	Negative	High
Xerox	XRX	BBB-	Negative	None	Negative	High
TE Connectivity	TEL	BBB+	Stable	None	Stable	Medium
Software						
Microsoft	MSFT	AA+	Stable	Wide	Stable	Medium
Alphabet	GOOG	AA	Stable	Wide	Stable	High
Oracle	ORCL	AA-	Stable	Wide	Negative	Medium
Adobe	ADBE	A+	Stable	Wide	Stable	Medium
CA, Inc	CA	A-	Stable	Narrow	Negative	Medium
Semiconductors						
Texas Instruments	TXN	AA-	Stable	Wide	Stable	Medium
Intel	INTC	AA-	Stable	Wide	Negative	Medium
Analog Devices	ADI	A	Stable	Wide	Stable	Medium
Applied Materials	AMAT	A+	Stable	Wide	Stable	High
Maxim Integrated Products	MXIM	A	Stable	Wide	Stable	High
Xilinx	XLNX	A	Stable	Narrow	Stable	Medium
KLA-Tencor	KLAC	BBB+	Stable	Wide	Stable	High
Advanced Micro Devices	AMD	B-	Stable	None	Stable	Very High
North American Telecom						
AT&T	T	BBB-	Stable	Narrow	Negative	Medium
Verizon Communications	VZ	BBB	Stable	Narrow	Stable	Medium
Rogers Communications	RCI	BBB-	Stable	Narrow	Stable	Medium
T-Mobile US	TMUS	BB	Stable	None	Positive	High
CenturyLink	CTL	BB-	Negative	None	Stable	Very High
Frontier Communications	FTR	B	Negative	None	Negative	Extreme
DISH Network	DISH	B+	Stable	None	Negative	Very High
Windstream	WIN	B-	UR-	NA	NA	NA
Sprint	S	B	Negative	None	Stable	Extreme
Media and Broadcasting						
Walt Disney Co.	DIS	A+	Stable	Wide	Stable	Medium
Comcast	CMCSA	A-	Stable	Wide	Stable	Medium
Omnicom	OMC	BBB+	Stable	Narrow	Stable	Medium
Scripps Interactive	SNI	BBB+	UR-	Narrow	Negative	High
CBS Corp.	CBS	BBB	Stable	Narrow	Stable	High
Discovery Communications	DISCA	BBB	UR-	Narrow	Stable	High
Interpublic Group	IPG	BBB	Stable	Narrow	Stable	Medium
Viacom	VIAB	BBB	Stable	Narrow	Stable	High
Netflix	NFLX	BB-	Stable	Narrow	Stable	Very High

* Denotes data provided by Morningstar, Inc. and licensed by Morningstar Credit Ratings, LLC.
Information as of Jan. 5, 2018. Source: Morningstar Credit Ratings, LLC and Morningstar, Inc.

About Morningstar® Credit Research

Morningstar Credit Research provides independent, fundamental equity research differentiated by a consistent focus on sustainable competitive advantages.

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