

## U.S. MIDDLE MARKET RISK REPORT

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## Private Firm Summary

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This semiannual report examines credit risk in the otherwise opaque U.S. private firm credit market. We report trends in five different areas of risk measurement: realized defaults, internal bank ratings, new originations, financial statement-based information, and model-based risk estimates. We derive the statistics in this report from Moody's Analytics Credit Research Database (CRD®).

This report contains EDF™ (Expected Default Frequency) values calculated using the RiskCalc™ U.S. 4.0 Corporate model. The stressed EDF is calculated using the RiskCalc Plus Stress Testing Model, ratio-based approach. The model adjusts a company's financial statements depending on how various statement inputs behave under different stress scenarios to calculate pro-forma FSO EDF values. The model also estimates stressed credit cycle signals under different scenarios. Combining the pro forma FSO EDF with the stressed credit cycle factors leads to a meaningful quarterly stressed EDF.

### Highlights

- >> Private firm default rates have declined steadily during the past five years. At 1.5%, the rolling 12-month default rate is down 73% from its September 2009 peak of 5.3% (Fig. 1). This trend has been driven primarily by a decline in the charge-off rate, now at its lowest level in the past ten years. In addition, the rate of borrowers in non-accrual status has decreased 53% since September 2009. The number of borrowers rated "Substandard" has seen a steady increase since the first quarter of 2015, above pre-crisis levels, reflecting banks' cautious lending practices (Fig. 2).
- >> Banks downgraded 16% of borrowers on their internal rating scales during the past year, compared to 14% in 2015 (Fig. 7). This finding suggests caution among banks.
- >> *Mining, Oil & Gas* show the highest percentage of balances adversely rated in 2016, at 54%. *Construction, Agriculture & Hunting*, and *Wholesale* follow at 13% each. (Fig. 6). Across all industries except *Mining, Oil & Gas*, the percentage of balances adversely rated remained relatively unchanged during the past year. This figure remains slightly lower than pre-crisis levels.
- >> New originations for C&I loans have climbed steadily since the financial crisis, reaching a new high in Q3 2015 (Fig. 9). However, the pace has slowed during recent quarters, and certain industries have been exceptionally volatile due to falling commodity prices, such as *Mining, Oil & Gas* (Fig. 10).
- >> The median RiskCalc 4.0 CCA EDF value for the U.S. rose from 0.6% in December 2015 to 0.8% in December 2016, a record high since the European debt crisis in 2011 (Fig. 11). The median CCA EDF increased significantly for Non-Pass borrowers during the past year, from 1.6% in June 2015 to 2.5% in June 2016 (Fig. 12).

>> Financial statement ratios generally improved in 2015, highlighting banks' decisions to extend credit to stronger borrowers. *Debt Coverage* is at its highest level in more than ten years, increasing 9% from its 2014 level. *Leverage*, as measured by retained earnings over current liabilities, has continued to improve during the past decade. *Sales Growth* and *Change in ROA*, despite slowing in 2015, have both remained positive after the crisis, indicating steady growth for borrowers. Borrower Size continued rising in 2015, indicating that banks increasingly prefer to lend to larger borrowers. We also observe rising *Inventory to Sales* ratios, as well as steady *Liquidity*, *ROA*, and *Current Liabilities to Sales* ratios (Fig. 15).

>> *Mining, Oil & Gas, Information & Culture* and *Real Estate & Leasing* displayed the highest EDF levels as of December 2016 (Fig. 16). All industries experienced increased EDF levels during the past year; *Mining, Oil & Gas* showed the largest EDF level increase, rising 125% since December 2015 (Fig. 17).

>> The median FSO EDF of vintage loans, grouped by year of origination, has declined steadily over the past decade. This finding indicates an improving overall credit risk profile for middle market portfolios and tighter lending standards (Fig. 14).

>> Among the ten states showcasing the largest change in EDF levels during the past ten years, Oklahoma and New Mexico experienced significant increases (Fig. 20). All states' median CCA EDF measures have fallen since June 2009, except Oklahoma (Fig. 21). On the other hand, we observe EDF measures increases in most states during the past year, led by Oklahoma, North Dakota, and Texas (Fig. 22).

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## Overview

### Introduction

This report uses realized default information, bank risk ratings, financial statement data, and RiskCalc Credit Cycle Adjusted (CCA) private firm EDF credit measures to provide insights into a market where data is otherwise unavailable. Data comes from the Moody's Analytics Credit Research Database (CRD). The CRD collects quarterly data from 19 U.S. lending organizations, including large institutions as well as smaller regional banks. The breadth and depth of the CRD make the data highly representative of the U.S. credit market. The CRD actively works with each institution to ensure a complete and thorough understanding of loan accounting and financial statement data. The CRD captures defaults in a consistent and accurate manner using information from each institution's loan accounting data.

TABLE 1

**CRD Data Characteristics<sup>1</sup>**

	COUNTS
Statements	2,025,935
Loan Accounting System Defaults	208,968
Statements with CCA EDF in December 2016	61,903
Defaults with Statements	60,954

TABLE 2

**Distribution of Defaults by Type**

	PERCENTAGE OF TOTAL DEFAULTS
90 Days Past Due (Non-Pass)	8%
Loss Provision	44%
Non-Accrual	25%
Charge-Off	13%
Loss	8%
Trouble Debt Restructuring	1%
Bankruptcy	0.2%
Unknown	1%

### Definition of Default

We define "default" in accordance with our interpretation of the Basel II directive. Our methodology detects default and near-default events over time for all banks. Borrowers are flagged as defaulters if they are 90 days past due with a non-pass rating, are in non-accrual status, have an internal bank rating corresponding to the regulatory ratings "Doubtful" or "Loss," or have an obligation partially or entirely charged-off. We also flag "Substandard" ratings, but consider these indicative of near-defaults and exclude them from our definition of default.

After detecting all defaults, we aggregate the data into a single default event for each defaulted borrower. For the date of default, we use the date of the borrower's earliest default event; for the severity of default, we use the borrower's most severe default type. Table 2 shows the distribution of defaults in the CRD by default type.

## Lending Performance Measures

Lending performance measures utilize loan accounting data provided by participating U.S. institutions. This data provides quarterly snapshots of loan level information, such as internal bank ratings, coupon rates, balances, and commitments for each institution's middle market commercial portfolio. We use this data to detect default events, to map internal bank ratings to a standard regulatory rating, and to track balance and commitment information over time. The CRD began collecting this data in 1999.

### Private Firm Default Rates

We present the default rate in three forms. Figure 1 provides a rolling 12-month default rate for U.S. private firms by default type. As noted above, a borrower is considered to be in default if 90 days past due with a non-pass rating, in non-accrual status, rated Doubtful or Loss, or partially or entirely charged-off. This default rate does not include borrowers rated as Substandard. Figure 3 presents the same information on a balance-weighted basis, with the default rate expressed as a percentage of the banks' outstanding balance amount, as of each quarter end date. Figure 2 includes borrowers rated as Substandard in its rolling 12-month default rate. While Figures 1 and 3 represent actual default occurrences over time, Figure 2 illustrates how banks perceive potential, future default risk. We calculate the default rate using all loan accounting records, regardless of whether or not there is a corresponding financial statement.

<sup>1</sup>CRD Data characteristics exclude companies in industries such as Finance & Insurance, Public Administration, Management, and Education.

Charts also include a projection value. We include this value because a significant reporting lag exists between default occurrence and the time when the default information is actually received. For example, as of December 2016, we observe borrowers that are 90 days past due, but have a pass rating. A certain proportion of these borrowers will become non-pass rated in the future. In such cases, we record each default as occurring on the date the borrower first became 90 days past due. An analysis using eight years of data shows that, on any given quarter end date, banks report approximately 88% of defaults occurring one year prior, 87% of those occurring nine months prior, 63% of those occurring six months prior, and only 50% of those occurring three months prior. The projection provides an estimate of what the actual default rate likely will be, once we receive all of the default information.

As of December 2016, private firm default rates have declined steadily over the past six years. At 1.5%, the rolling 12-month default rate is down 73% from its September 2009 peak of 5.3% (Fig. 1). The trend has been driven primarily by a decline in the charge-off rate, now at 0.4%, its lowest level in the last ten years. In addition, the proportion of borrowers in non-accrual status has decreased by 52% since September 2009. The percentage of borrowers rated "Substandard" has seen a steady increase since the fourth quarter of 2014 and remains slightly above pre-crisis levels, reflecting banks' cautious lending practices (Fig. 2).

Figure 1 Rolling 12-Month Private Firm Default Rate by Default Type

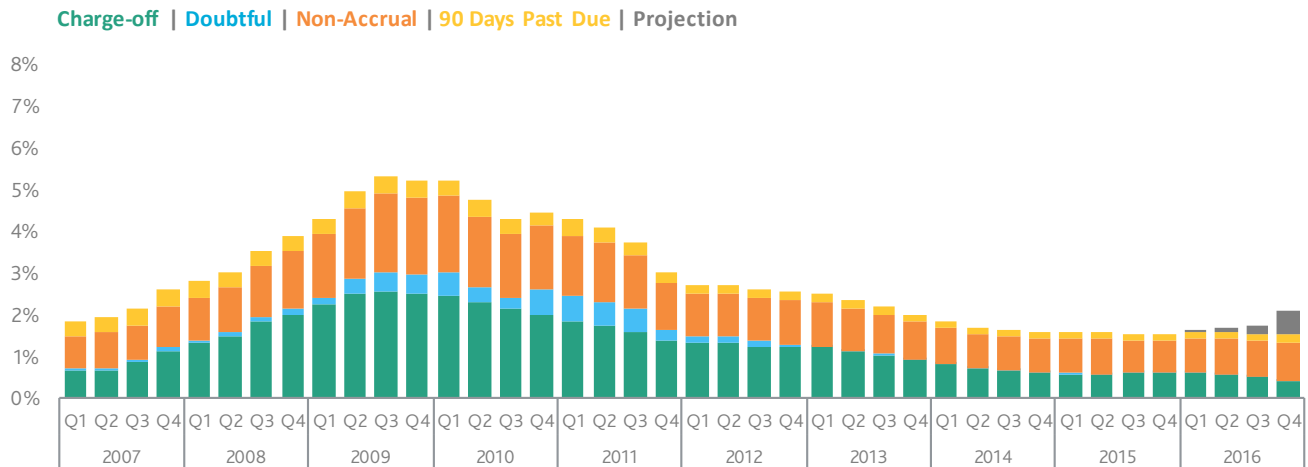
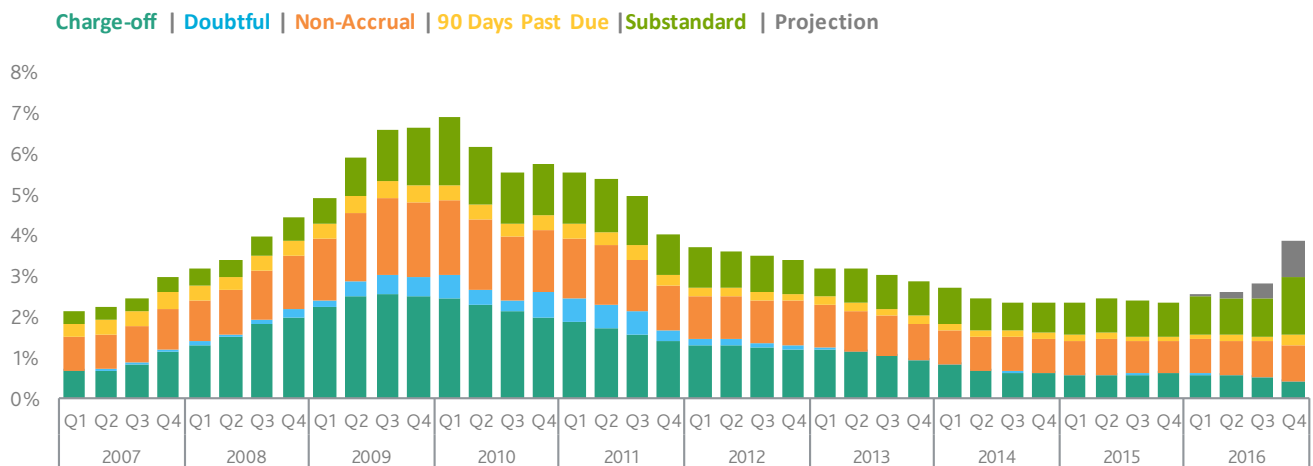


Figure 2 Rolling 12-Month Private Firm Default Rate by Default Type, Including Near-Defaults<sup>2</sup>

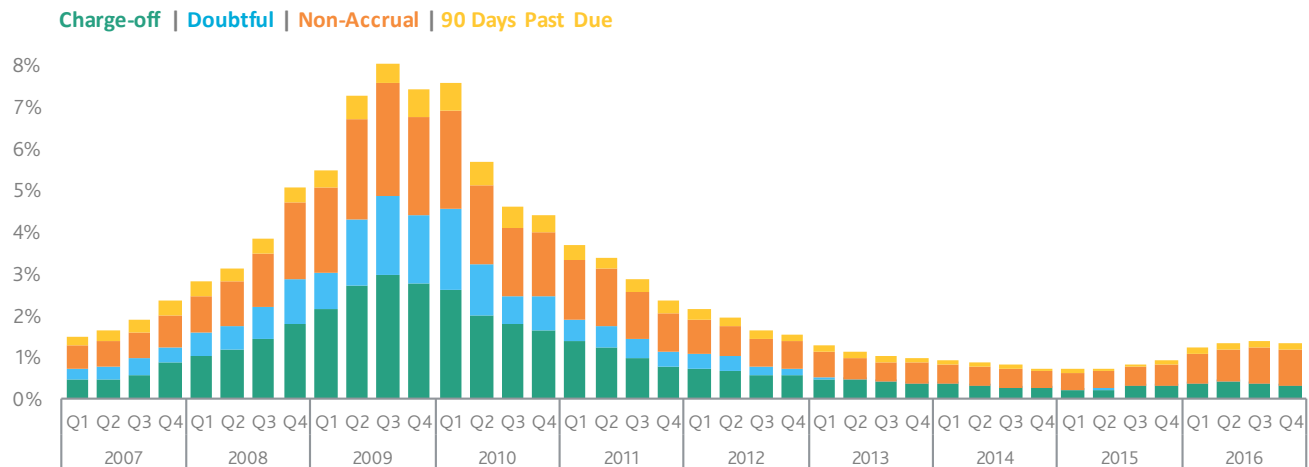


<sup>2</sup> We calculate the rolling 12-month default rate as the total number of defaulted and near-defaulted (i.e., Substandard) borrowers during the past four quarters, divided by the average number of borrowers across the same four quarters.

Figure 3 shows the 12-month rolling default rate, weighted by outstanding balance, for the entire CRD. Like its unweighted counterpart in Figure 1, a borrower is considered to be in default if they are 90 days past due with a non-pass rating, in non-accrual status, rated Doubtful or Loss, or partially or entirely charged-off. However, in contrast to Figure 2, this default rate does not include borrowers rated as Substandard.

While all three above graphs show a similar trend, it is particularly interesting to note that in 2013 and 2014, the balance-weighted default rate (Fig. 3) actually dipped below the equally-weighted rate (Fig. 1). However, this trend reversed in 2015 when energy firms, which tend to be more capital-intensive than other industries, began defaulting at higher rates amid the oil price slump.

Figure 3 Twelve-Month Rolling Overall Default Rate, Weighted by Outstanding Balance



### Adversely Rated Credits

This analysis examines the actual and perceived future risk of the portfolios contained in the Credit Research Database. Figure 4 shows the rates at which borrowers classified as Substandard migrated to more or less severe classifications during the past five years.

Figure 5 presents adversely rated credits as a percentage of all loan balances over time. Table 3 shows adversely rated credits as a percentage of total loan balances by year and industry. Figure 6 presents adversely rated credits as a percentage of loan balances, as of December 2016, by regulatory rating and industry. Because many banks cease tracking loan information once a loss occurs, loss percentages are most likely higher than presented.

The number of Substandard borrowers upgraded has been comparable or greater than that of those downgraded for the past five years (Fig. 4). Additionally, the percentage of balances rated Substandard has come down from the 11% high mark posted in December 2009, now at 3% (Fig. 5).

The percentage of balances adversely rated continues to decrease from the 26% high mark posted in June 2009, now at 8% (Fig. 5). *Mining, Oil & Gas* bears the greatest percentage of adversely rated balances as of December 2016 (Fig. 6), increasing to 54% from 40% in one year (Table 3). The stark increase may be attributed to the commodity price slump since late 2014. *Construction* continues to carry a high percentage of adversely rated balances (Fig. 6), but it has seen a 0.1% improvement since December 2015 (Table 3). Adverse ratings are much less prevalent in *Finance & Insurance* and in sectors with significant government interest or oversight, such as *Public Administration* (Fig. 6).

Figure 4 Migration from Substandard to Other Classifications

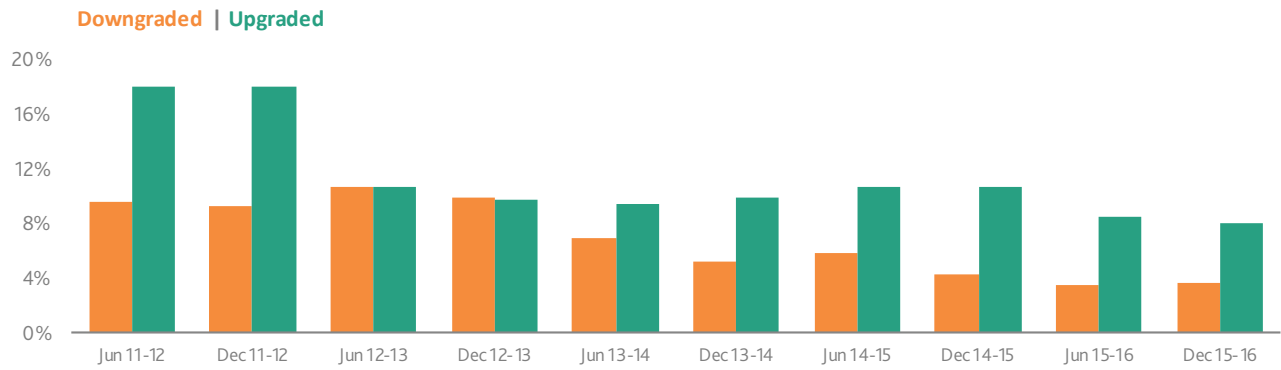


Figure 5 Percentage of Balances with Adverse Bank-Assigned Regulatory Ratings, as of the end of Q4 2016

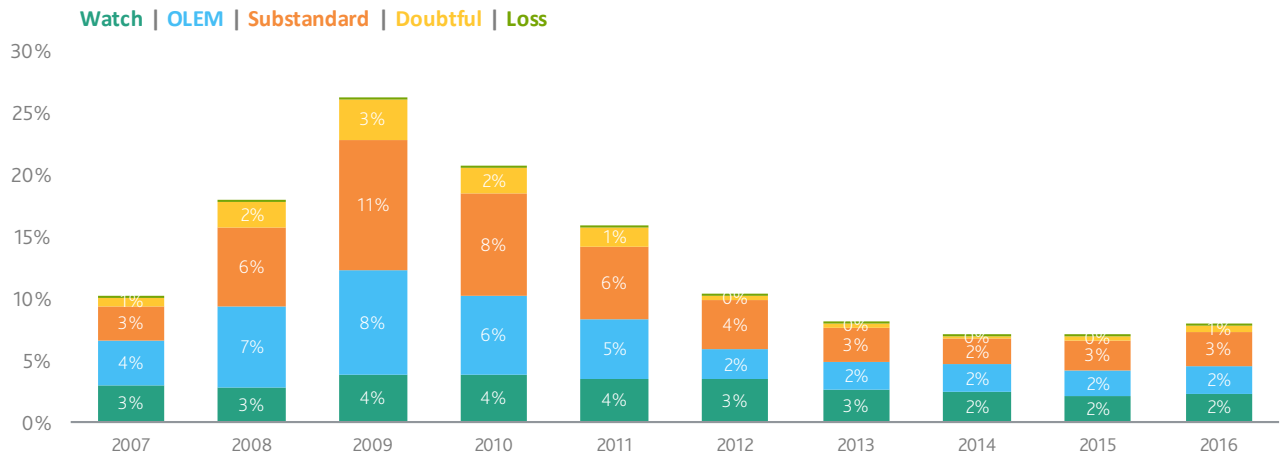
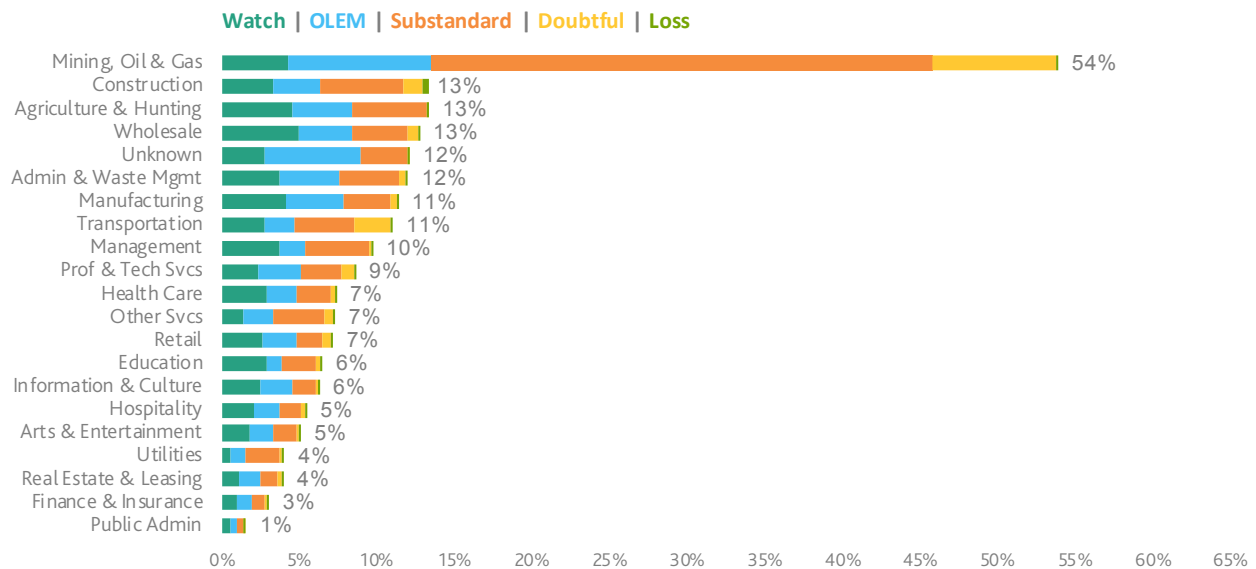


TABLE 3

## Percentage of Balances with Adverse Bank-Assigned Regulatory Ratings, by Industry and Year

	2012	2013	2014	2015	2016
Admin & Waste Mgmt	12.3%	12.1%	10.3%	10.9%	11.9%
Agriculture & Hunting	15.8%	15.2%	11.1%	12.4%	13.3%
Arts & Entertainment	11.0%	8.4%	7.0%	5.8%	4.9%
Construction	28.8%	21.5%	16.6%	13.4%	13.3%
Education	7.6%	6.4%	5.7%	6.2%	6.4%
Finance & Insurance	6.8%	3.4%	4.0%	2.6%	2.9%
Health Care	7.4%	7.3%	6.0%	5.0%	7.3%
Hospitality	11.6%	8.0%	7.6%	5.9%	5.3%
Information & Culture	8.6%	6.3%	6.0%	4.2%	6.2%
Management	11.9%	12.2%	8.2%	6.8%	9.6%
Manufacturing	12.6%	10.4%	9.5%	9.6%	11.3%
Mining, Oil & Gas	12.7%	7.6%	8.5%	39.5%	53.8%
Other Svcs	13.3%	10.3%	9.1%	7.4%	7.2%
Prof & Tech Svcs	10.6%	9.6%	9.7%	8.6%	8.6%
Public Admin	2.5%	1.9%	1.3%	1.2%	1.4%
Real Estate & Leasing	15.1%	8.6%	5.3%	4.0%	3.9%
Retail	11.1%	9.1%	7.5%	6.0%	7.1%
Transportation	7.9%	7.4%	7.6%	8.0%	10.9%
Unknown	27.5%	21.7%	15.9%	11.7%	12.0%
Utilities	6.4%	4.7%	3.9%	4.5%	3.9%
Wholesale	10.6%	10.6%	11.3%	11.5%	12.6%

Figure 6 Percentage of Balances with Adverse Bank-Assigned Regulatory Ratings in Current Period, by Industry



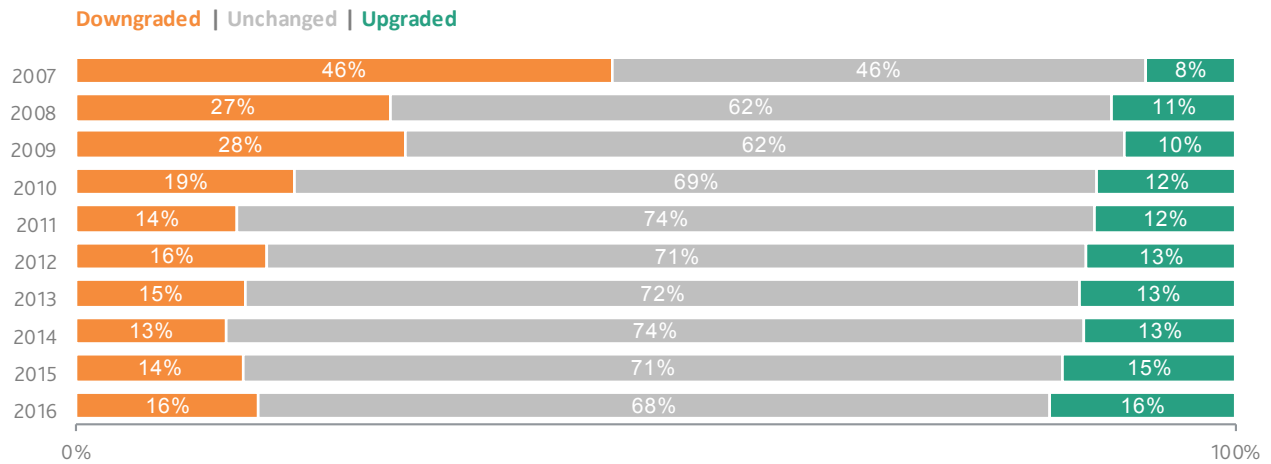


### Internal Risk Rating Migration Summary

The rate at which banks change internal risk ratings reveals how they interpret changes in the credit risk of their portfolios. Figure 7 shows the migration of internal risk ratings assigned to borrowers by institutions annually since 2007. A borrower is considered "Upgraded" when an institution changes its risk rating to one that is less severe; a borrower is considered "Downgraded" when the rating increases in severity.

In 2016, banks downgraded 16% of borrowers, compared to 14% a year ago.

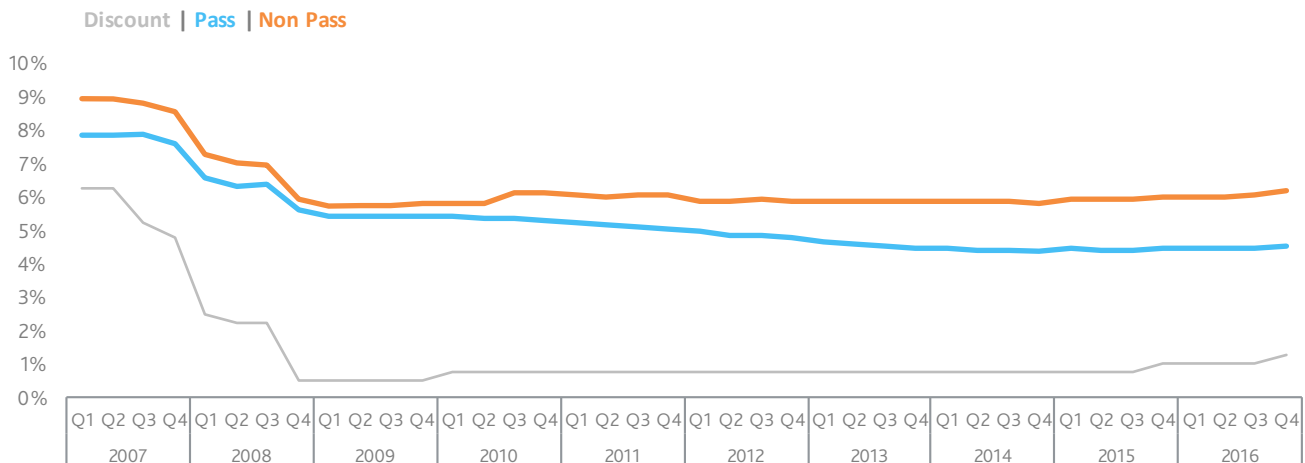
Figure 7 Yearly Migration Summary of Bank-Assigned Risk Ratings



### Coupon Rates

Figure 8 presents the average coupon rate by bank-assigned regulatory rating over time. The figure also shows the primary credit discount rate offered by the Federal Reserve. Interest rates for non-pass borrowers in the middle market have seen a slow and steady increase since the first quarter of 2015. Meanwhile, the interest rate spread between the two widened marginally, from 156 basis points in December 2015 to 161 basis points in December 2016.

Figure 8 Mean Coupon Rates by Regulatory Rating Over Time



### New Originations

The following section examines the new origination of commercial and industrial (C&I) loans to middle-market borrowers, using loan accounting data from CRD. We translate growth rates to level indices that represent the dynamics of new origination for the aggregate set of banks. In order to measure the organic growth rates in loan originations over time, the underlying data was smoothed out by computing four-quarter moving averages across each data point, and adjusted by excluding the effects of mergers & acquisitions, banks opting out of CRD participation, and other factors.<sup>3</sup>

Figure 9 shows the rate of new originations for all loans, with the level at Q1 2007 indexed to 100. Growth in new originations exceeded pre-recession levels in Q3 2015, but has declined slightly since then.

Figure 9 New Originations for All Loans by Quarter, Indexed to Q1 2007 = 100

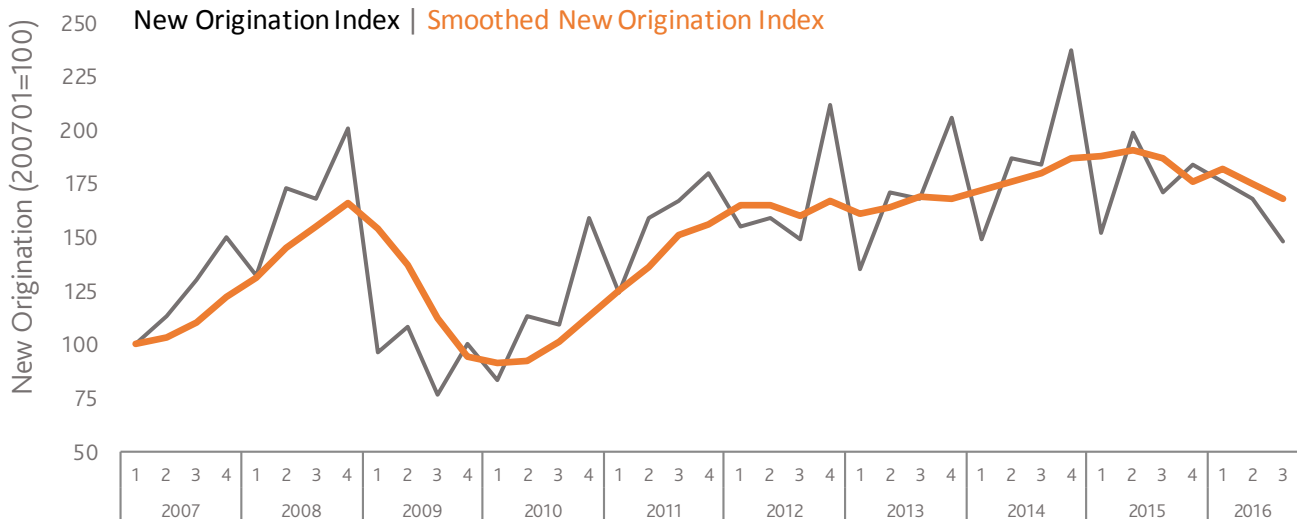
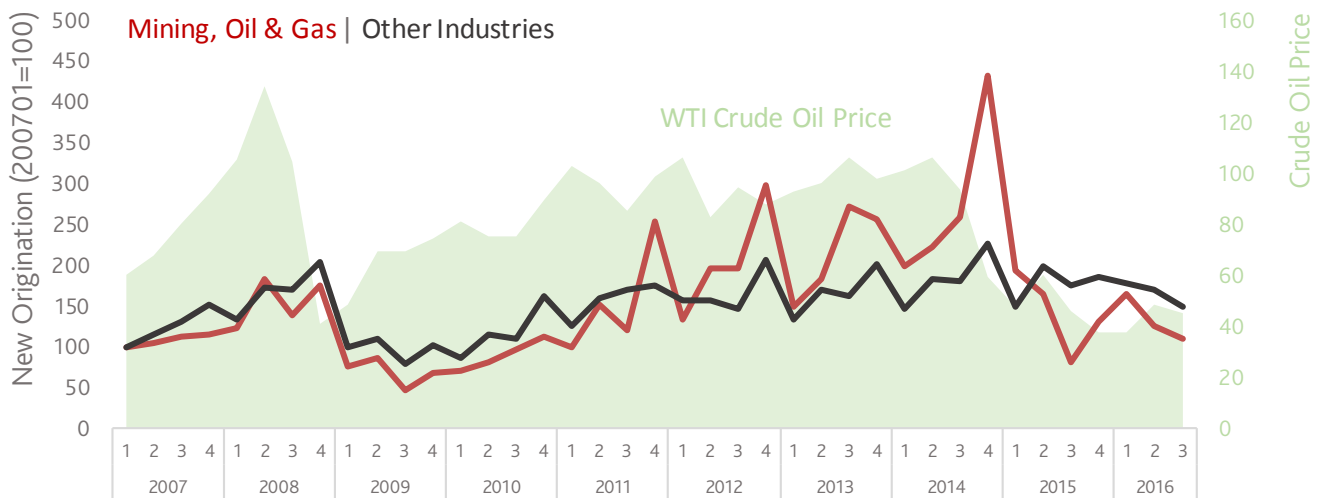


Figure 10 presents the loan origination activity for the *Mining, Oil & Gas* industry relative to the WTI crude oil price. In the graph, we can see that they are highly correlated. Due to the impact of commodity prices on corporate earnings, the *Mining, Oil & Gas* industry tends to be much more volatile than others'.

Figure 10 WTI Crude Oil Price (USD/barrel) vs. Origination Activity Indexed to Q1 2007 = 100



<sup>3</sup> For more details regarding methodology, please see Jeng, Xu & Yahalom. (October 2016). [What Do 20 Million C&I Loan Observations Say about New Origination Dynamics? – Insights from Moody's Analytics CRD Data.](#)

## EDF Credit Measures

We generate the EDF credit measures presented throughout this report using RiskCalc 4.0 U.S. Corporate Financial Statement Only (FSO) mode and Credit Cycle Adjusted (CCA) mode. Unlike the Financial Statement Only (FSO) mode, which delivers EDF credit measures based primarily on financial and industry information, the CCA mode adjusts for the market's current credit cycle assessment. We measure this factor using the distance-to-default estimate from Moody's Analytics Public Firm Model. The CCA EDF credit measure is a forward-looking indicator of probability of default.

### RiskCalc 4.0 CCA EDF Credit Measure Trends

Figures 11 and 12 present Credit Cycle Adjusted (CCA) One-Year EDF credit measures over time. Figure 12 segments by regulatory rating.

The median RiskCalc 4.0 CCA EDF value for the U.S. rose from 0.6% in December 2015 to 0.8% in December 2016. The median CCA EDF bottomed at 0.5% in Q2 2014. (Fig. 11). The median CCA EDF significantly increased for Non-Pass borrowers over the past year, from 2.0% in December 2015 to 2.7% in December 2016 (Fig. 12).

Figure 11 CCA EDF Credit Measures Trends<sup>4</sup>

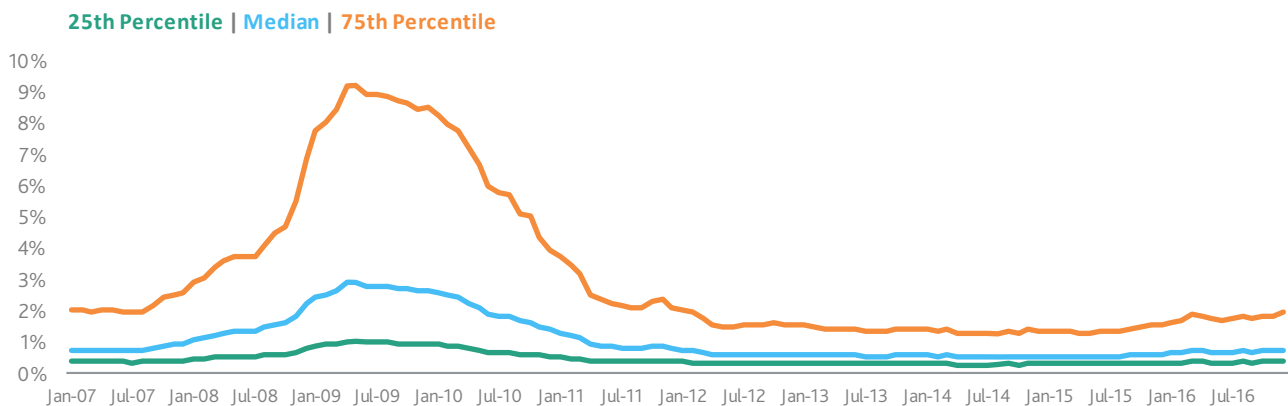
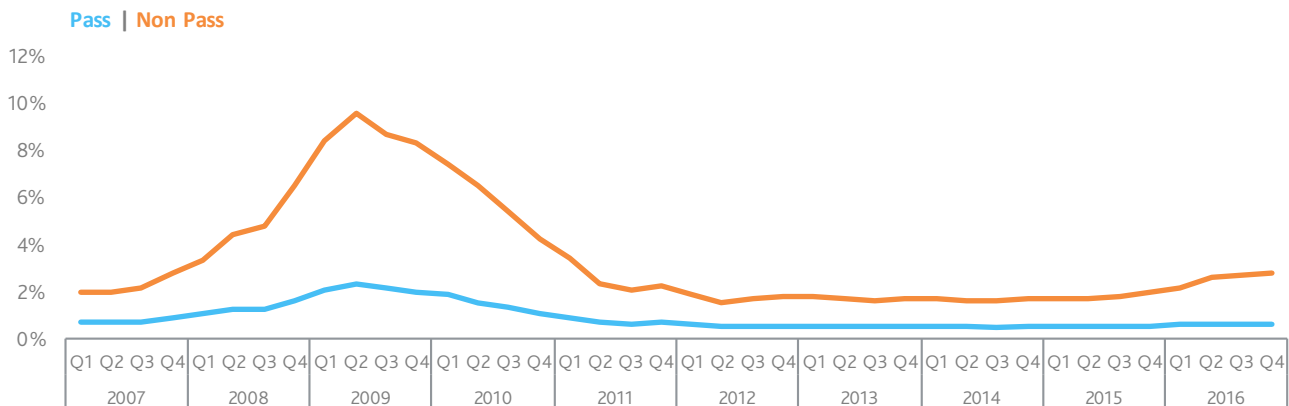


Figure 12 Median CCA EDF Credit Measures by Regulatory Rating<sup>5</sup>



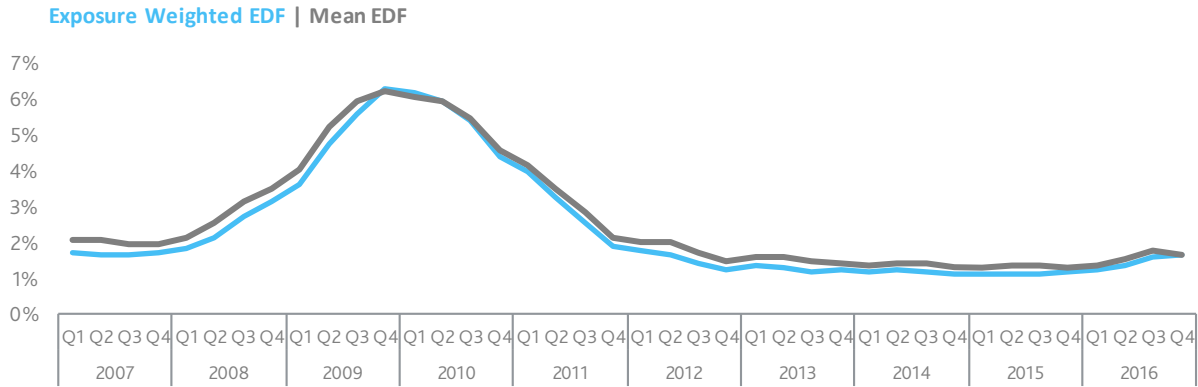
<sup>4</sup> This chart displays monthly CCA EDF observations. It does not include borrowers from industries for which RiskCalc is not designed, such as Vehicle Dealers, Financials, Insurance, Government Services, and Real Estate.

<sup>5</sup> This chart displays quarterly CCA EDF observations due to the reporting frequency of bank loan accounting data.

**RiskCalc 4.0 Exposure-Weighted Average CCAEDF Credit Measure**

Figure 13 depicts the exposure-weighted average EDF credit measure compared against the mean EDF credit measure for borrowers with both an EDF credit measure and an outstanding exposure, as of the quarter-end for the past ten years.

Figure 13 Exposure-Weighted Average vs. Mean CCA EDF Credit Measure

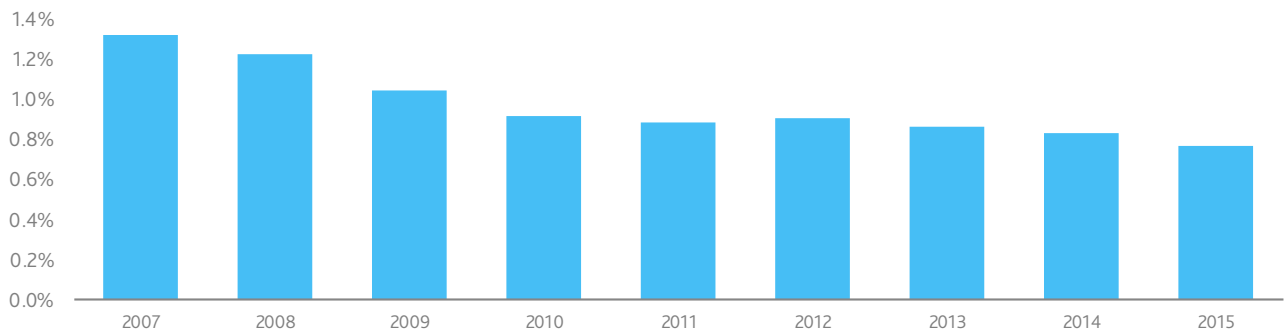


**RiskCalc 4.0 FSO EDF Credit Measure Loan Vintage Analysis**

Figure 14 presents risk level as measured by credit loans' median FSO EDF by year of origination.

Similar to the trends following previous economic downturns, loans originated between 2009–2011 showed a decreasing level of risk. The median FSO EDF for different types of vintage loans all fell in 2015. The convergence indicates the improving credit risk profile of middle market portfolios and tighter lending standards.

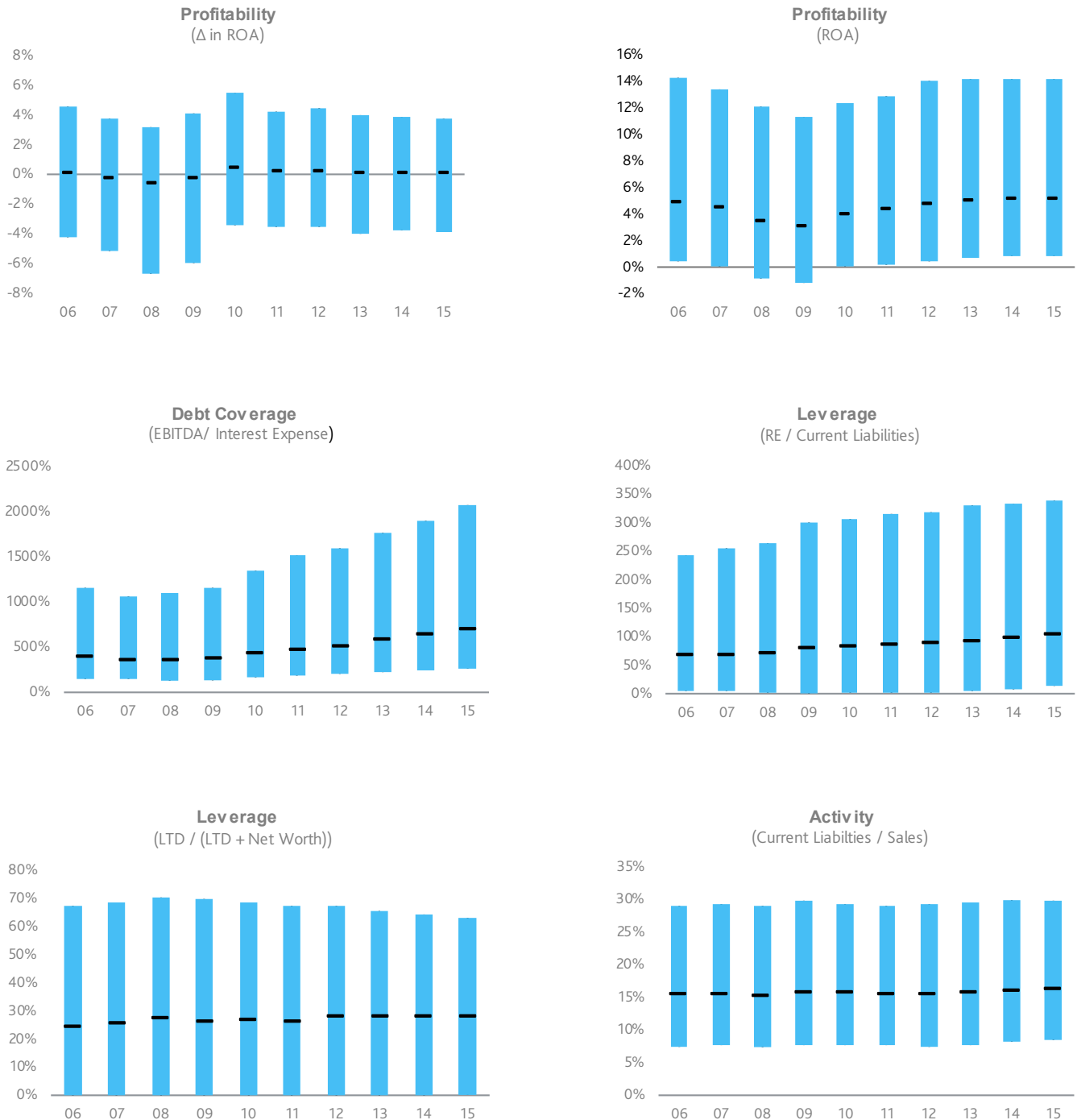
Figure 14 Median Financial Statements Only (FSO) One-Year EDF by Origination Year

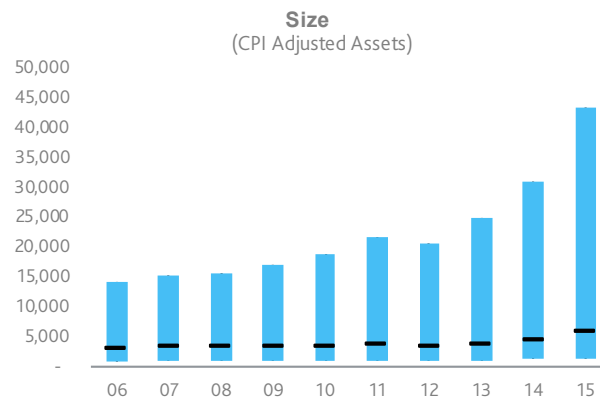
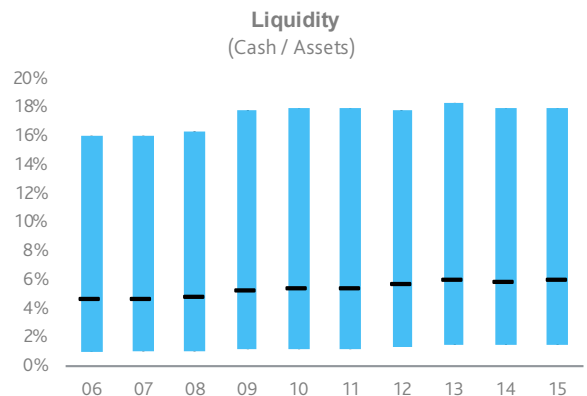
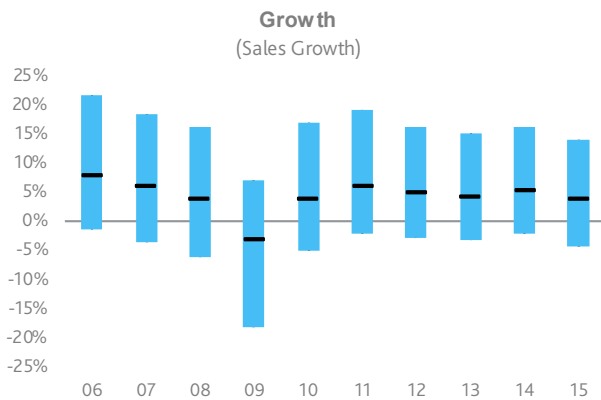
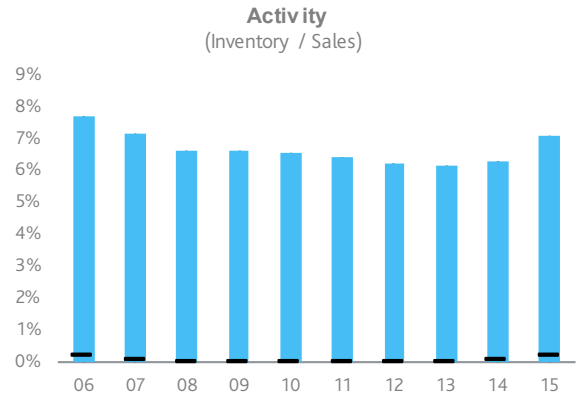
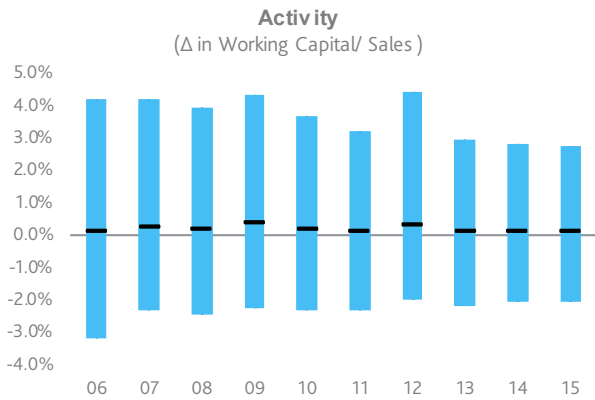


**RiskCalc 4.0 Ratio Trends**

Figure 15 presents RiskCalc ratio percentiles over time and does not incorporate any credit cycle adjustment. The median of borrowers' financial ratios generally improved in 2015. *Debt Coverage* is at its highest level in more than ten years, increasing 9% from its 2014 level. *Leverage*, as measured by retained earnings over current liabilities, has continued to improve over the past decade. *Sales Growth* and *Change in ROA*, despite slowing in 2015, have both remained positive after the crisis, indicating steady growth for borrowers. Borrower *Size* continued rising in 2015, indicating that banks increasingly prefer to lend to larger borrowers. We also observe rising *Inventory to Sales* ratios, as well as steady *Liquidity*, *ROA*, and *Current Liabilities to Sales* ratios.

Figure 15 Financial Statement Ratios Used in RiskCalc 4.0 (25<sup>th</sup>, 50<sup>th</sup>, and 75<sup>th</sup> Percentiles)





**Industry Analysis**

Table 4 presents median CCA EDF credit measures by NAICS industry, as of June, for each of the past ten years. Figures 16 through 18 show CCA EDF credit measures by sector as of December 2016: Figure 16 presents median EDF values, Figure 17 shows percentage changes in median EDF over the past year, and Figure 18 presents the percentage of borrowers in each industry with an EDF value above the 90th percentile for the entire population.

The industries with the greatest risk in December 2016, as measured by RiskCalc CCA EDF credit measures, were *Mining, Oil & Gas*, *Information & Culture*, and *Real Estate & Leasing*. (Fig. 16). All industries had elevated EDF levels during the past year. *Mining, Oil & Gas* showed the largest EDF level increase, climbing 125% since December 2015 (Fig. 17).

*Mining, Oil & Gas* also showed the largest concentration of highly risky borrowers: 27% of firms in this sector had CCA EDF values higher than 90% of the overall population (Fig. 18). *Information & Culture* and *Agriculture & Hunting* were the second and third riskiest sectors using this measure, both around 14%. *Utilities*, at 4%, had the lowest proportion of highly risky borrowers.

TABLE 4

**Median CCA EDF Values by NAICS Sector<sup>6</sup>**

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Admin & Waste Mgmt	0.91%	1.88%	2.17%	1.25%	0.77%	0.66%	0.65%	0.61%	0.63%	0.66%
Agriculture & Hunting	0.84%	1.77%	2.63%	2.16%	0.93%	0.51%	0.73%	0.64%	0.70%	0.91%
Arts & Entertainment	0.98%	2.68%	3.38%	1.54%	0.79%	0.65%	0.60%	0.56%	0.62%	0.82%
Construction	1.72%	3.44%	3.79%	2.38%	1.55%	0.96%	0.95%	0.89%	0.88%	0.84%
Health Care	0.51%	1.14%	1.40%	0.76%	0.50%	0.42%	0.40%	0.36%	0.41%	0.52%
Hospitality	0.86%	2.56%	3.26%	1.43%	0.71%	0.54%	0.47%	0.50%	0.52%	0.64%
Information & Culture	1.07%	2.96%	3.86%	1.88%	0.96%	0.91%	0.85%	0.69%	0.88%	1.24%
Manufacturing	1.03%	2.56%	3.26%	1.75%	0.85%	0.70%	0.60%	0.56%	0.68%	0.85%
Mining, Oil & Gas	0.50%	1.23%	1.25%	1.09%	0.55%	0.48%	0.55%	0.58%	0.80%	1.80%
Other Svcs	0.53%	1.47%	2.15%	0.95%	0.52%	0.47%	0.42%	0.41%	0.45%	0.55%
Prof & Tech Svcs	0.84%	1.71%	2.01%	1.17%	0.74%	0.63%	0.59%	0.59%	0.60%	0.59%
Public Admin	0.41%	0.88%	1.32%	0.75%	0.44%	0.38%	0.36%	0.33%	0.37%	0.41%
Real Estate & Leasing	1.43%	3.59%	4.32%	2.30%	1.27%	1.00%	0.90%	0.84%	0.97%	1.13%
Retail	1.17%	3.06%	3.44%	1.60%	0.87%	0.66%	0.63%	0.61%	0.69%	0.85%
Transportation	1.03%	2.23%	2.36%	1.58%	0.82%	0.58%	0.55%	0.55%	0.69%	0.90%
Utilities	0.29%	0.59%	0.79%	0.46%	0.27%	0.23%	0.29%	0.26%	0.35%	0.46%
Wholesale	0.88%	2.15%	2.27%	1.22%	0.67%	0.57%	0.56%	0.54%	0.62%	0.79%

<sup>6</sup> This chart presents median EDF credit measures as of December of each year.

Figure 16 One-Year CCA EDF Measures by NAICS Sector

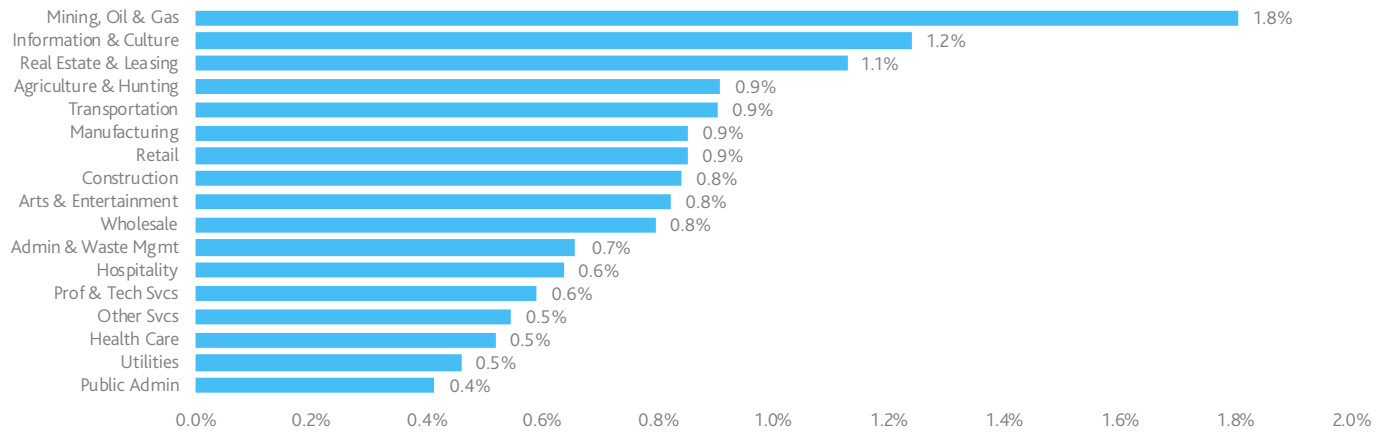


Figure 17 Percentage Change in CCA EDF Credit Measures During Past Year

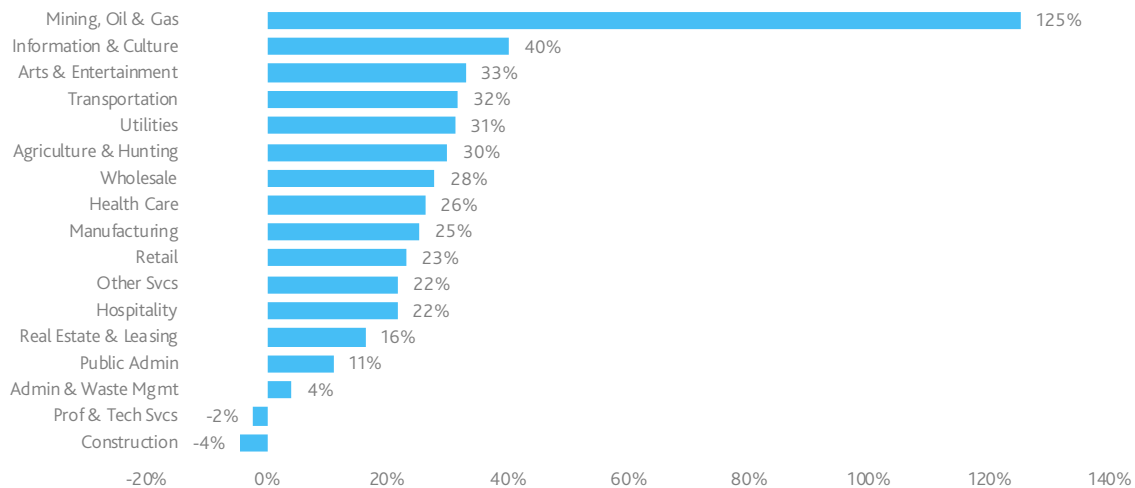
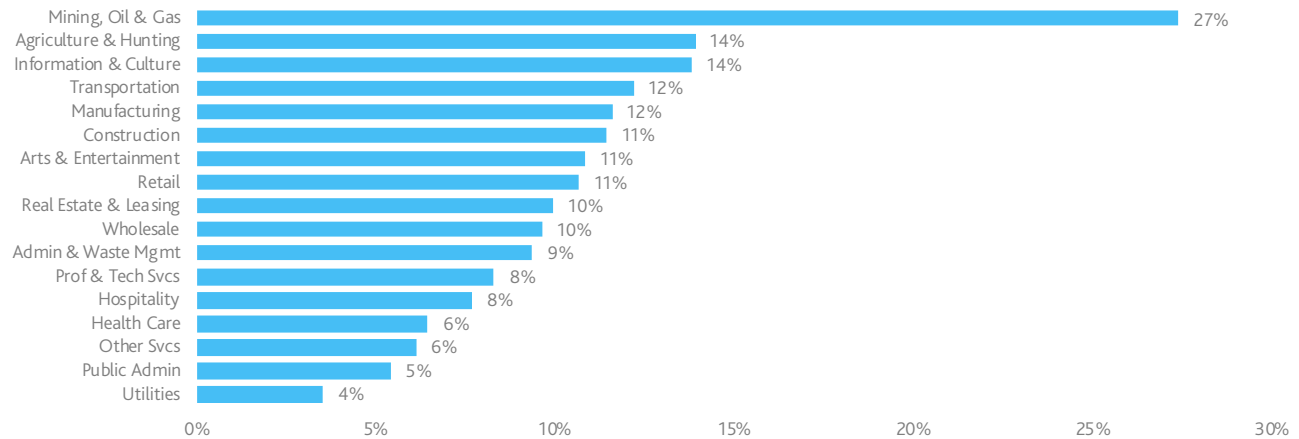




Figure 18 Percentage of Firms with CCA EDF Values Greater than 90<sup>th</sup> Percentile

### Credit Migration

This section reports CCA EDF credit measure migrations during three different periods. To construct each migration matrix, we group firms into rating categories using their CCA EDF credit measures. Tables 5, 6, and 7 show annual transition rates averaged during the periods since December 2006 (ten years ago), December 2011 (five years ago), and December 2015 (one year ago), respectively.

TABLE 5

### CCA EDF-Implied Rating Migration: Average One-Year Rating Migration Rates (%), Over Ten-Year Period

(2006-2016) TO														MIGRATION SUMMARY	
FROM	A1	A2	A3	Baa1	Baa2	Baa3	Ba1	Ba2	Ba3	B1	B2	B3	Caa-C	%UP	%DOWN
A1	37.1	34.3	10.3	5.2	5.7	3.3	1.8	0.5	0.4	1.0	0.1	0.1	0.1		62.9
A2	11.9	33.6	20.5	11.7	10.9	5.0	2.5	1.4	1.0	0.6	0.3	0.2	0.3	11.9	54.5
A3	2.8	20.4	23.2	16.3	19.0	8.0	4.0	2.1	1.6	1.0	0.6	0.4	0.5	23.2	53.6
Baa1	0.8	9.9	17.9	18.9	26.3	11.8	5.8	3.2	1.9	1.5	0.8	0.5	0.7	28.6	52.5
Baa2	0.2	3.3	9.2	13.6	31.4	19.7	9.7	4.6	3.0	2.1	1.1	0.8	1.3	26.3	42.2
Baa3	0.0	0.8	3.0	6.2	23.5	27.8	17.3	8.2	4.7	3.3	1.8	1.3	2.0	33.6	38.6
Ba1	0.0	0.3	1.0	2.5	12.4	23.2	24.5	14.3	8.3	5.3	2.8	2.1	3.4	39.4	36.2
Ba2	0.0	0.1	0.4	1.1	6.3	14.5	23.0	20.1	13.5	8.6	4.3	3.1	5.1	45.4	34.5
Ba3	0.0	0.1	0.2	0.6	3.6	8.7	16.6	20.0	18.3	13.3	6.7	4.7	7.1	49.8	31.9
B1	0.0	0.0	0.1	0.4	2.0	5.4	11.0	15.4	18.7	18.4	10.1	7.2	11.2	53.1	28.5
B2	0.0	0.0	0.1	0.2	1.4	3.5	7.3	10.8	15.3	19.2	14.4	11.0	16.7	57.9	27.7
B3	0.0	0.0	0.1	0.2	1.0	2.5	5.2	8.2	11.8	16.9	15.0	14.5	24.7	60.9	24.7
Caa-C	0.0	0.0	0.0	0.1	0.6	1.4	2.9	4.6	6.6	10.6	11.3	14.1	47.7	52.3	

TABLE 6

## CCA EDF-Implied Rating Migration: Average One-Year Rating Migration Rates (%), Over Five-Year Period

(2011-2016) TO													MIGRATION SUMMARY		
FROM	A1	A2	A3	Baa1	Baa2	Baa3	Ba1	Ba2	Ba3	B1	B2	B3	Caa-C	%UP	%DOWN
A1	41.8	33.5	10.1	5.0	4.5	2.3	1.4	0.6	0.4	0.2	0.2	0.0	0.0		58.2
A2	11.0	39.1	21.5	10.4	9.2	3.8	2.2	1.0	0.7	0.4	0.2	0.2	0.2	11.0	49.8
A3	2.3	21.1	27.2	17.9	17.2	6.5	3.2	1.8	1.2	0.8	0.4	0.3	0.3	23.4	49.4
Baa1	0.7	8.7	20.0	22.2	27.3	10.0	4.6	2.5	1.5	1.2	0.5	0.3	0.4	29.4	48.3
Baa2	0.2	3.0	8.4	15.2	36.2	19.9	8.0	3.5	2.1	1.6	0.8	0.5	0.6	26.7	37.0
Baa3	0.1	0.8	2.5	5.6	25.0	32.9	17.3	6.7	3.6	2.3	1.3	0.9	1.0	33.9	33.1
Ba1	0.0	0.3	1.0	2.2	11.4	25.5	28.8	14.4	6.8	4.0	2.2	1.5	1.9	40.5	30.7
Ba2	0.0	0.1	0.4	1.1	5.8	13.7	26.1	23.9	13.9	6.8	3.2	2.1	2.9	47.1	28.9
Ba3	0.0	0.1	0.3	0.7	3.5	8.1	16.7	23.4	21.3	13.5	5.2	3.4	4.0	52.7	26.0
B1	0.0	0.1	0.2	0.4	2.1	5.3	10.7	16.0	21.9	21.0	9.9	5.7	6.7	56.7	22.3
B2	0.0	0.0	0.1	0.3	1.7	3.8	7.3	11.0	16.0	22.4	16.2	10.4	10.9	62.5	21.2
B3	0.0	0.0	0.1	0.2	1.2	2.8	5.5	8.8	12.0	17.4	17.2	15.9	19.0	65.1	19.0
Caa-C	0.0	0.0	0.0	0.2	0.8	1.7	3.6	5.7	7.3	11.9	12.5	15.5	40.8	59.2	

TABLE 7

## CCA EDF-Implied Rating Migration: Average One-Year Rating Migration Rates (%), Over One-Year Period

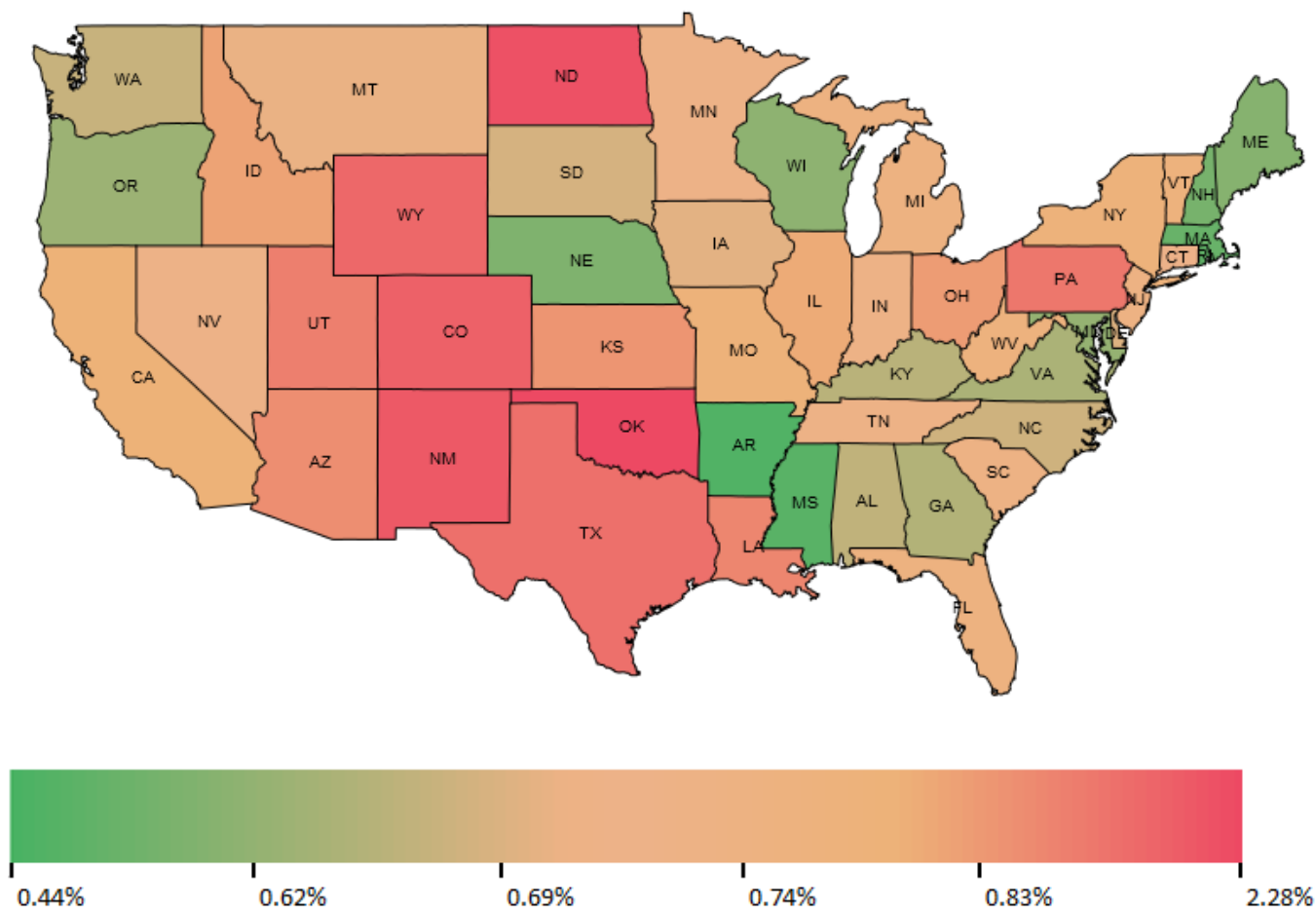
(2015-2016) TO													MIGRATION SUMMARY		
FROM	A1	A2	A3	Baa1	Baa2	Baa3	Ba1	Ba2	Ba3	B1	B2	B3	Caa-C	%UP	%DOWN
A1	21.3	42.4	15.6	7.9	6.3	2.6	1.6	0.7	0.6	0.5	0.4	0.1	0.0		78.7
A2	3.1	32.4	29.2	14.4	11.3	4.2	2.5	1.1	0.9	0.4	0.1	0.2	0.2	3.1	64.5
A3	0.5	10.0	25.1	23.5	22.6	8.6	3.9	2.0	1.4	1.1	0.4	0.4	0.4	10.5	64.3
Baa1	0.1	3.3	12.8	22.4	34.7	12.8	5.6	3.3	1.7	1.5	0.7	0.3	0.7	16.2	61.3
Baa2	0.0	1.1	4.4	10.1	35.5	26.2	10.6	4.5	2.8	2.1	1.1	0.7	0.9	15.5	49.0
Baa3	0.0	0.2	1.0	3.1	16.8	34.0	23.2	9.5	4.7	3.0	1.7	1.3	1.5	21.1	44.9
Ba1	0.0	0.1	0.5	1.3	7.2	18.1	29.9	20.0	9.2	5.3	3.2	2.0	3.4	27.1	43.0
Ba2	0.0	0.0	0.1	0.6	3.7	8.9	19.4	26.0	19.5	10.2	4.1	2.8	4.6	32.7	41.3
Ba3	0.0	0.0	0.1	0.4	2.5	5.2	11.3	18.9	24.0	19.4	7.1	4.7	6.5	38.4	37.6
B1	0.0	0.0	0.0	0.3	1.6	4.0	7.0	10.9	18.3	24.3	14.7	8.2	10.6	42.2	33.5
B2	0.0	0.0	0.1	0.1	1.2	2.9	6.5	8.5	11.8	19.0	18.6	14.9	16.5	50.0	31.4
B3	0.0	0.0	0.1	0.1	0.9	2.1	4.9	6.8	9.8	14.0	15.3	17.9	28.1	53.9	28.1
Caa-C	0.0	0.0	0.0	0.1	0.4	0.9	2.1	5.2	6.3	9.3	10.3	13.7	51.7	48.3	

### Regional Analysis<sup>7</sup>

The map below (Figure 19) reports EDF credit measures by state. To estimate each state's median credit risk score, we use the median one-year CCA EDF score assigned by the RiskCalc U.S. 4.0 Model as of December 2016. The spectrum legend below the U.S. heat map contains the range of observed median EDF values in December 2016. Washington, D.C. has the lowest median EDF, 0.4%, while Oklahoma has the highest median EDF, 2.3%.

Figures 20 through 22 present the ten largest changes in median EDF credit measures by state since December 2006, June 2009 (the end of the most recent recession), and December 2015, respectively. Oklahoma and New Mexico saw the largest hikes in median CCA EDF values compared to ten years ago. Both state economies took a hit from the recent oil price drop. Michigan and North Carolina showed the largest improvements, with 45% declines (Fig. 20). All states' median CCA EDF measures have fallen since June 2009, except Oklahoma. North Carolina led all states during this period with an improvement of 85% (Fig. 21). On the other hand, we observe EDF measure elevation in most states in the past year, led by Oklahoma (172%), North Dakota (67%), and Texas (60%) (Fig. 22).

Figure 19 One-Year CCA Median EDF Values by State as of December 2016



<sup>7</sup> The data used in constructing this map contains a relatively small number of observations from Wyoming, Vermont, Hawaii, and Alaska. For each state, median EDF values may reflect different data population characteristics including lenders (CRD Participants) and distributions of borrowers across industries, asset sizes, and other characteristics that may materially impact EDF values for that state. EDF calculations using RiskCalc 4.0 do incorporate some state-level macroeconomic factors, such as unemployment.

Figure 20 Top-Ten Largest Changes in One-Year CCA Median EDF since December 2006

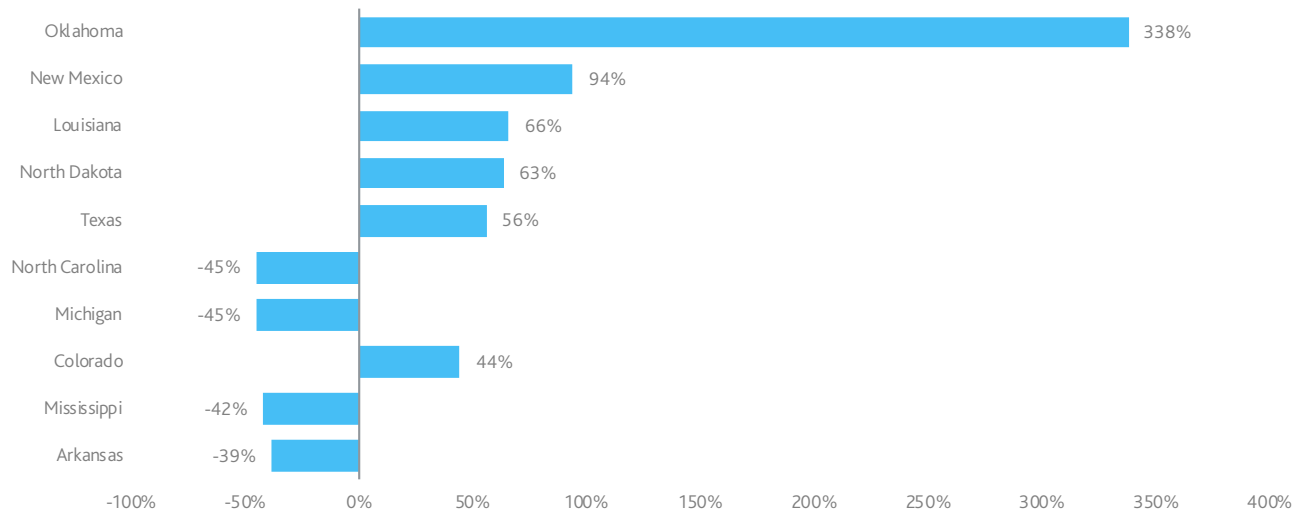


Figure 21 Top-Ten Largest Changes in One-Year CCA Median EDF Since June 2009

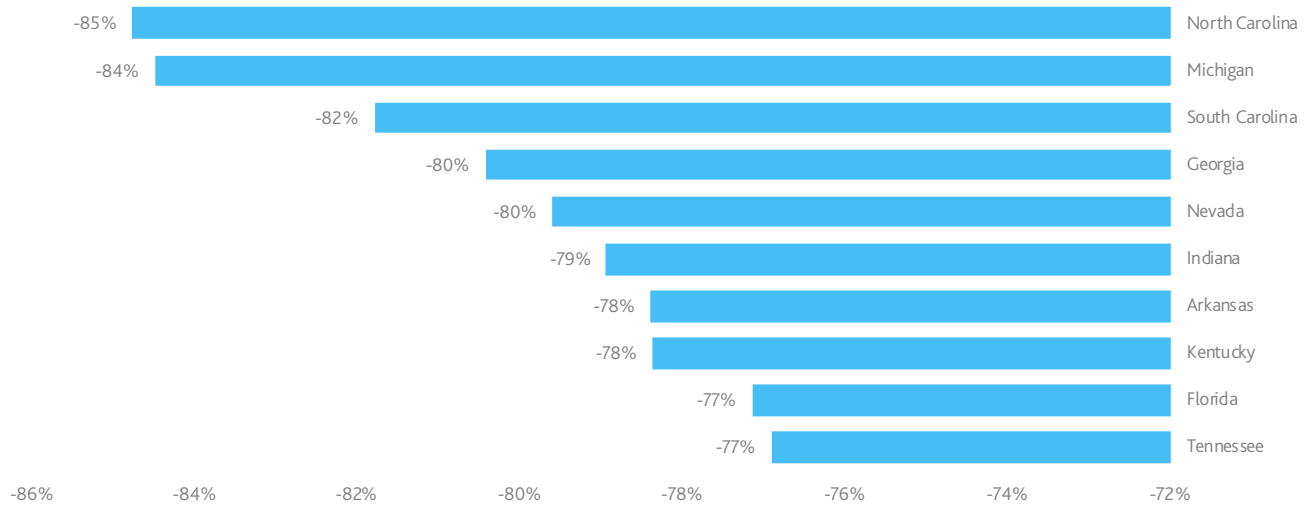
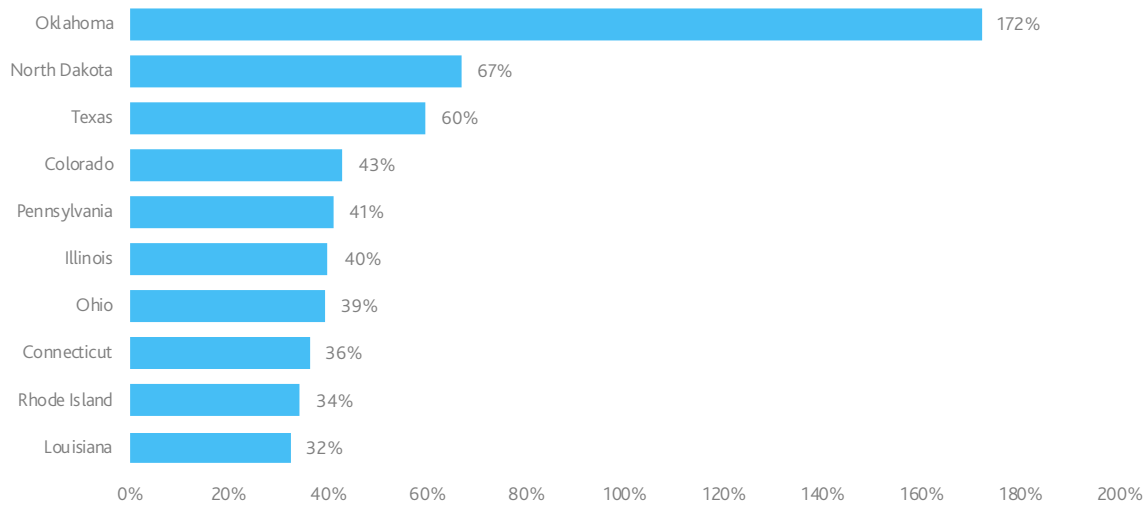


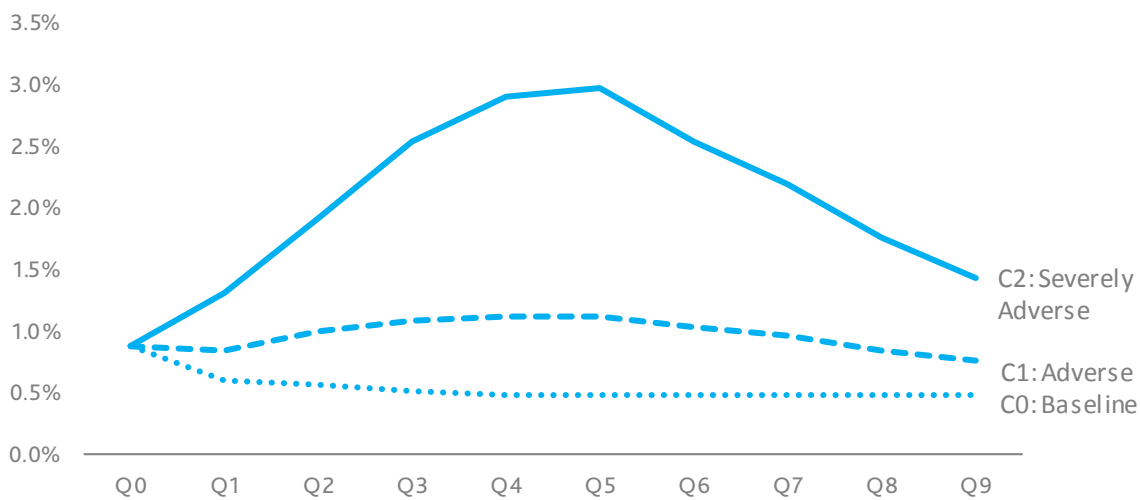
Figure 22 Top-Ten Largest Changes in One-Year CCA Median EDF Since December 2015



### Stressed EDF Analysis<sup>8</sup>

Figure 23 presents the stressed EDF forecast based on the Federal Reserve's Comprehensive Capital Analysis and Review (CCAR) scenarios. The graph is based on scores from the most recent statement for each company in CRD, no older than four years old. We calculate the annualized, nine-quarter EDF measure forecasts using a forecast date of March 2017 on the February 2017 CCAR scenarios.

Figure 23 Median, Ratio-Based Stressed EDF



<sup>8</sup> The stressed EDF analysis is updated annually.

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## Conclusion

Overall, private-firm credit risk in the U.S. middle market has improved since peaking in 2009. The market has shown credit soundness during the past year, illustrated by the stable, rolling 12-month default rate and the median FSO EDF level. Changes in borrowers' financial positions during the past year have generally been positive, as seen in RiskCalc ratios (Fig. 15). The actual default rate steadily decreased during the past five years (Fig. 1), while the RiskCalc 4.0 One-Year CCA EDF credit measure continued to rise during the past two years (Fig. 11), indicating potential deterioration.

*Mining, Oil & Gas* has continued to display stress since the commodity price slump during late 2014 (Fig. 16). This drop has caused loan default rates to spike in states such as Oklahoma and Texas, negatively affecting their regional economies (Fig. 19).

Meanwhile, lenders have remained conservative. The overall number of bank-assigned risk rating downgrades outnumbered upgrades (Fig. 7), although upgrades are more common than downgrades for Substandard borrowers (Fig. 4).

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