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25 October 2016

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Deutsche Bank AG

Deutsche Bank's Adversity Lifts its Probability of Default

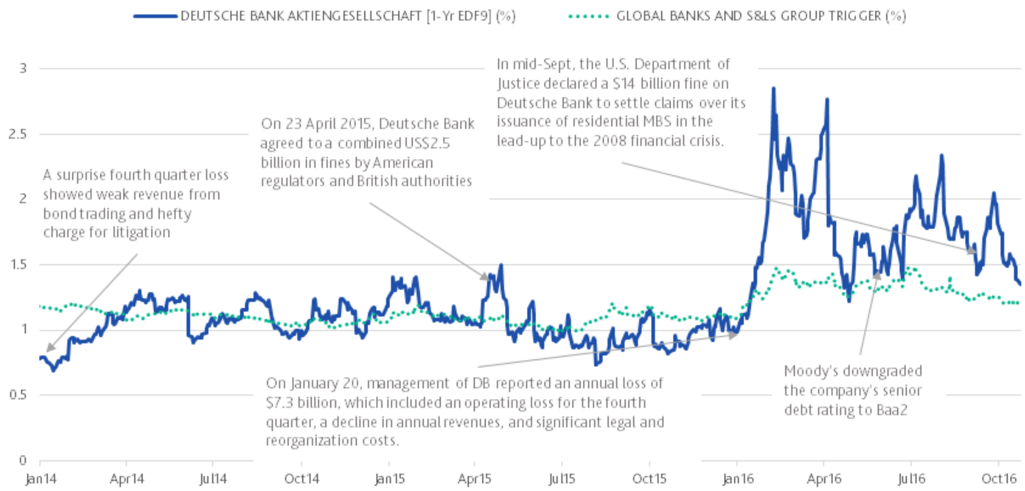
Germany's biggest bank, Deutsche Bank AG, faced intense scrutiny from investors in recent months. The company's EDF™ (Expected Default Frequency) has shown signs of deterioration as the company's financial risk has been elevated, as measured by its market leverage. In January the bank reported its first full-year loss since the financial crisis. This exemplifies banks' current difficulties, with low interest rates limiting their ability to generate profits from deposits, loans, and other market services. Deutsche Bank's losses included €5.2 billion in provisions for fines and lawsuits.

The firm's one-year EDF measure increased from 1.05% in January to its all-time high of 2.85% on February 9 (Figure 1). Since then, the EDF measure has declined somewhat, but remains volatile, reflecting Deutsche Bank's lingering financial problems. Deutsche Bank's US unit failed a Federal Reserve "stress test" in June, and the International Monetary Fund named the bank as "the most important net contributor to systemic risks." One of the latest additions to the myriad of challenges is the $14 billion fine proposed by the US Department of Justice over Deutsche Bank's issuance of residential mortgage-backed securities in the lead-up to the financial crisis.

Deutsche Bank's elevated risk profile is reflected in the company's current EDF measure of 1.39%. This level is also above the Global Banks and S&Ls group's optimal threshold level. Moody's Analytics has established thresholds for each industry group, which flags companies with elevated default risk[1]. The optimal threshold, or value at which firms in the Global Banks and S&Ls Group should be flagged for additional review, is 1.22%. Only 15% of companies in this group[2] have EDF measures above this level, suggesting that the group itself is relatively safe. The fact that Deutsche's EDF is just slightly above the trigger level implies that the firm is not facing imminent risk of default but requires close monitoring.

THIS REPORT WAS REPUBLISHED ON 27 OCTOBER 2016 WITH CLARIFICATION ON THE TREND OF DEUTSCHE BANK'S EDF MEASURE AND THE MEDIAN EDF OF ITS PEER INDUSTRY GROUP ON PAGE 3

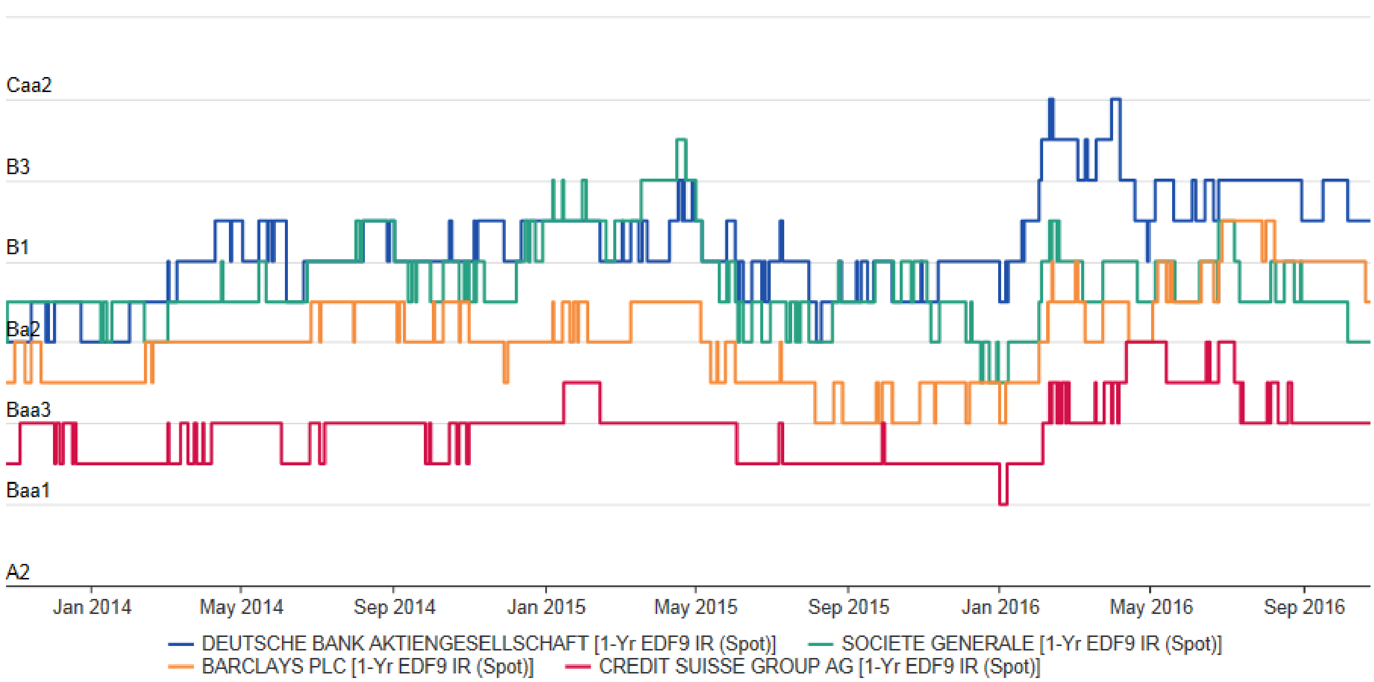
FIGURE 1. Deutsche Bank's One-Year EDF Measure vs. Global Banks and S&Ls Group's Optimal Threshold Level



EDF measures in ratings space

EDF credit metrics are continuous measures of a firm's default risk. However, some users prefer to analyze credit risk in ratings language to differentiate levels and make relative comparisons. Figure 2 shows that Deutsche Bank's current one-year EDF measure maps to an EDF implied rating of B2, suggesting it is non-investment grade with a relatively high chance of default. Also shown in Figure 2 are the EDF-implied ratings for some of Deutsche's peers — Barclay's Plc, Credit Suisse, and Societe Generale. Despite having the lowest EDF-implied rating among these select peers since the beginning of this year, Deutsche Bank's EDF-implied rating has remained in B2-B3 range for the last six months. Yet Barclay's EDF-implied rating deteriorated by two notches over the same period, from Ba2 to its current B1. These contrasting trends suggest that while DB's EDF measure warrants consistent monitoring, some of its peers have experienced credit deterioration at a more accelerated pace in the recent months.

FIGURE 2. Deutche Bank and Peers' EDF Measures in Ratings Space



The importance of relative EDF change

In addition to Deutsche Bank's EDF measure rising, the EDF also underperformed its peers in the Global Banks and S&Ls industry group. In Figure 3 we show the trend in Deutsche's EDF measure over time, as well as the median, 25th, 75th, and 90th EDF percentiles for its industry peer group. The rise of the bank's EDF credit measure represents the struggles that the company has faced over the last few years. The firm's EDF measure has been trending above the median EDF for its industry sector, and is currently 3 times higher than the median of its sector. Notably, since the beginning of the year, Deutsche's EDF measure has crossed the 90th percentile of its group several times, signaling a more severe warning of default risk compared to its peers. Furthermore, Deutsche Bank's EDF has been rising as the median EDF level for the Global Banks and S&Ls group has held steady, with its current sector EDF metric of 0.42% little changed over the same period.

FIGURE 3: Deutche Bank's EDF measure vs EDF Distribution of its Industry Peer Group

Firms that underperform their industry sector experience higher default rates, regardless of the level of their EDF measure, as Moody's Analytics' research has established. While we see that in Figure 3 Deutsche Bank ranks at the industry's 87th riskiest percentile, it is just as important to analyze the trend in Deutsche Bank's EDF level, as well as the increase position relative to its peer group.

Using data from 1999 through 2014, Moody's Analytics calculated one-year default rates conditioned on a firm's EDF level and on the relative change in its EDF versus its industry sector. Relative performance is calculated as the ratio of each firm's EDF measure to the median EDF measure of its industry peer group. For example, a Relative EDF level of two means that a firm's EDF level is twice as high as the median for its peer group. Figure 4 shows one-year empirical default rates, by EDF quartile, by Relative EDF change quartile, and within each combination of EDF level and Relative EDF change quartile[3]. As shown in the last column, default risk rises as EDF level rises. The bottom row demonstrates that default risk also rises as Relative EDF change rises. Looking within each EDF level quartile (any of the first four rows), we notice that default risk rises as Relative EDF change increases even among firms with similar EDF levels. This is particularly noticeable in the third and fourth EDF level quartiles. In other words, looking at Relative EDF change, in addition to EDF level alone, provides incremental benefit to an already strong signal of default risk. A key finding of our analysis is that firms with EDF levels higher than the median EDF of their industry peer group are 10 times more likely to default than their industry peer group[4]. High and rising EDF measures in both absolute and relative terms indicate that a firm has come under serious financial pressure.

FIGURE 4: One-Year Default Rates Conditioned on EDF level and Relative EDF Change (%)

Rising EDF Change

Rising EDF Level

	EDF Level Relative to Peer Group				
EDF Level	**0-25%**	**25%-50%**	**50%-75%**	**75%-100%**	**All**
0-25%	0.084	0.042	0.039	0.063	0.057
25%-50%	0.195	0.125	0.146	0.238	0.176
50%-75%	0.273	0.374	0.426	0.577	0.412
75%-100%	1.182	1.952	3.146	5.609	2.918
All	0.431	0.616	0.913	1.531	0.869

Rising Default Risk

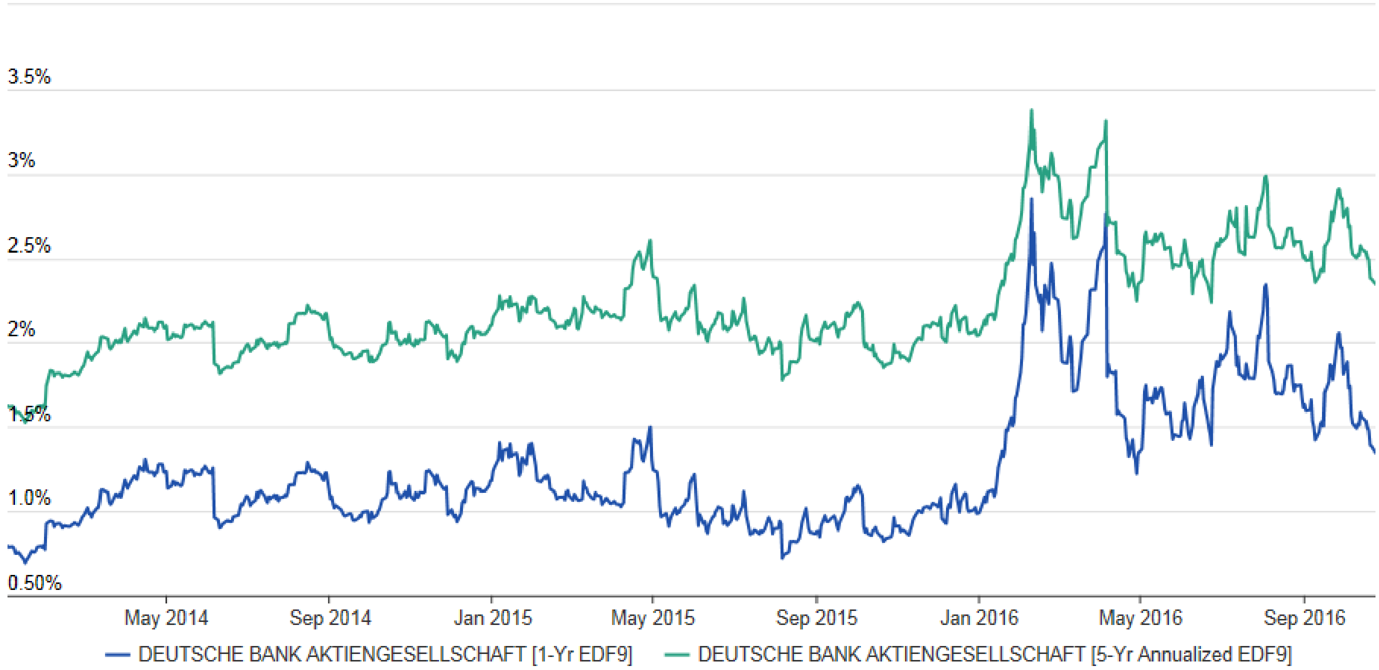
Rising Default Risk

Signals from the EDF term structure

Analyzing the company's term structure of EDF measures, which under the updated EDF9 model tends to be upward sloping during an economic expansion, unless it is in distress, can shed additional light on just how risky the firm is. Even as the global banking industry faces challenges like low or negative interest rates, tougher regulations, and weak economic growth, of the 1,323 companies in the Global Banks and S&Ls group just 21 currently show a downward sloping EDF curve, suggesting that such instances are relatively rare.

Figure 5 shows Deutsche Bank's five-year annualized EDF measure and its one-year EDF measure. We observe that the gap between the two measures has narrowed since the beginning of the year, but the PD curve hasn't inverted. The bank's normal PD curve suggests a somewhat smaller near-term risk of default.

FIGURE 5: Deutsche Bank's One- and Five- Year EDF Measures (%)



A Closer Look at the EDF Drivers

The sharp increase in Deutsche Bank's EDF measure can be understood in terms of the two key drivers of EDFs, market leverage (financial risk) and asset volatility (business risk). In contrast to some black-box statistical models of credit risk, the drivers of the EDF model draw on the fundamental approach to credit analysis while supplementing it with market information. Studying these EDF components reveals that Deutsche Bank's high and volatile EDF measure is primarily caused by an increase in the default point and a decline in the market value of assets, which increased the firm's market leverage. Market leverage summarizes a firm's financial risk and is defined as the ratio of a firm's default point to its market value of assets (expressed as a percentage). Unlike book leverage, market leverage reflects the forward-looking views of investors. One can view changes in the market value of a firm's assets as investors' collective view on the expected profitability of a company: when the market value of assets goes up, investors expect future cash flows to increase. The opposite is true when the market value of assets goes down, as in the current case.

Figures 6 and 7 show Deutsche Bank's key EDF drivers over the last decade. The bank's financial risk has been steadily increasing since the 2008 global financial crisis, with the pace of deterioration accelerating since year end-2015 as the company faced operating losses and legal issues (Figure 6). Compared to other firms in the industry, Deutsche Bank's market leverage, which is simply the ratio of a firm's default point to its market value of assets, is in the 96th percentile, making it one of the riskiest banks by that metric. Since June 2008, Deutsche's market value of assets has dropped by about 35% from $2.3 trillion to its current level of $1.5 trillion, significantly closer to its current default point of $1.4 trillion. Historically, when a firm's market value of assets falls below the default point, it is highly likely that the firm will be unable to sell assets or raise additional capital to pay its creditors.

As shown in Figure 7, the increase in the Deutsche Bank's asset volatility in mid-2008, which reflects its operating performance, has contributed to the deterioration of its EDF measure. The bank's asset volatility remained relatively steady from 2010 until the end of 2014, and has declined since, which helped to limit the rise in the bank's EDF, even as the bank became more leveraged.

FIGURE 6: Deutsche Bank's Market Leverage, Market Value of Assets, and Default Point

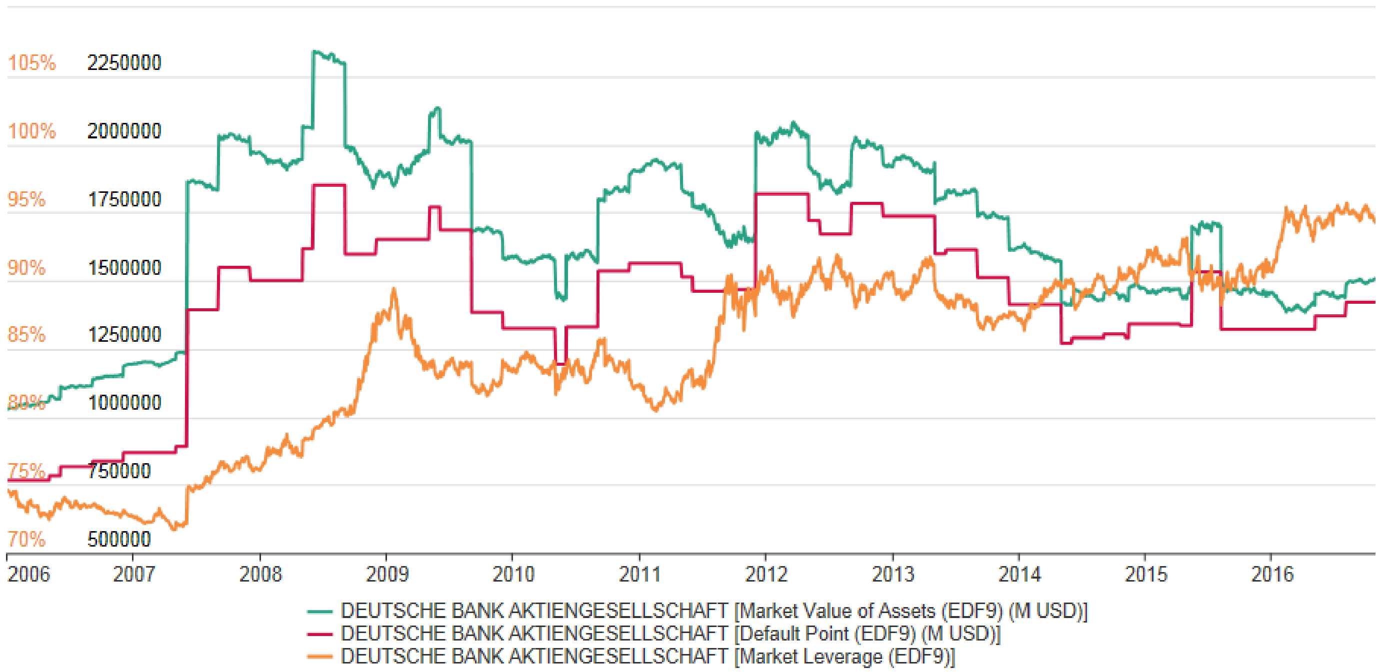
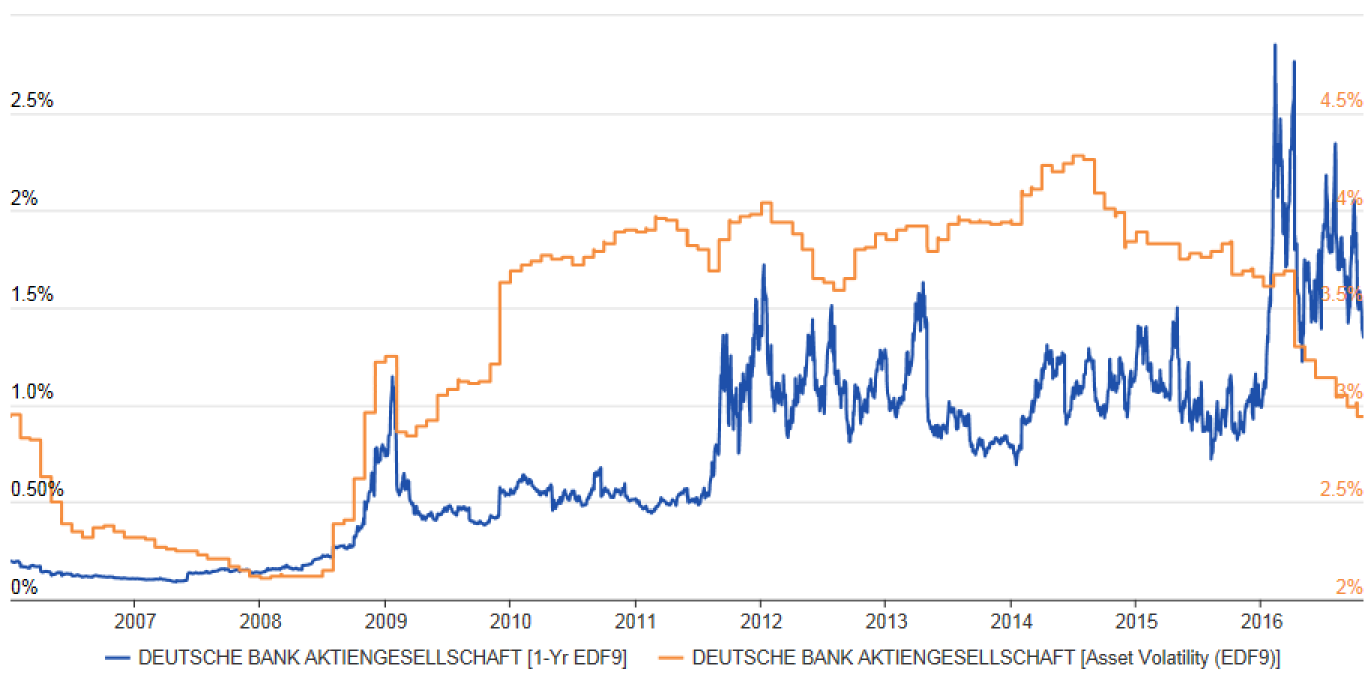


FIGURE 7: Deutsche Bank's One-Year EDF Measure and Asset Volatility



Conclusion

The one-year EDF measure (Expected Default Frequency) for Deutsche Bank, the largest German bank by assets, has been elevated since the middle of 2008, signaling rising default risk. The pace of deterioration in its EDF metric began to accelerate this past year, as the bank faced concerns that it may need more capital or government involvement to continue its operations. Deutsche Bank's EDF measure also underperformed its peers in the global banking sector. Both the elevated level in the firm's EDF metric and the change relative to its sector peers make Deutsche one of the riskiest names in its peer group. Yet other signs suggest that it is not at imminent risk of default. Its EDF metric has breached the 90th percentile of its peer group only a handful of times since January 2016, and its EDF curve remains upward sloping. Assessing credit risk is rarely a simple process and, as with most credits, Deutsche Bank provides mixed signals of default risk. The data confirm that the bank has limited near-term risk of default, but its creditworthiness needs to be monitored closely on an ongoing basis.

Endnotes

1 The optimal threshold is calibrated using actual defaults. It aims to maximize the number of true positives and true negatives while minimizing the number of false positives and false negatives. For more information please refer to "Using EDF Measures to Identify At-Risk Names – A Monitoring & Early Warning Toolkit".

2 Global Banks and S&Ls Group consists of 1,323 companies.

3 It is worth emphasizing that EDF levels are measured at a point in time, and empirical default rates are measured one year after that date. The results in Figure 3 highlight the predictive power of EDF levels and Relative EDF changes.

4 Peer groups are defined by country and industry (e.g., US Automotive Group), or if that group has less than 10 constituents, just industry (e.g., Global Automotive Group).

REPORT NUMBER 1047485

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