

## EDF™ CASE STUDY

Moody's Capital Markets Research, Inc.

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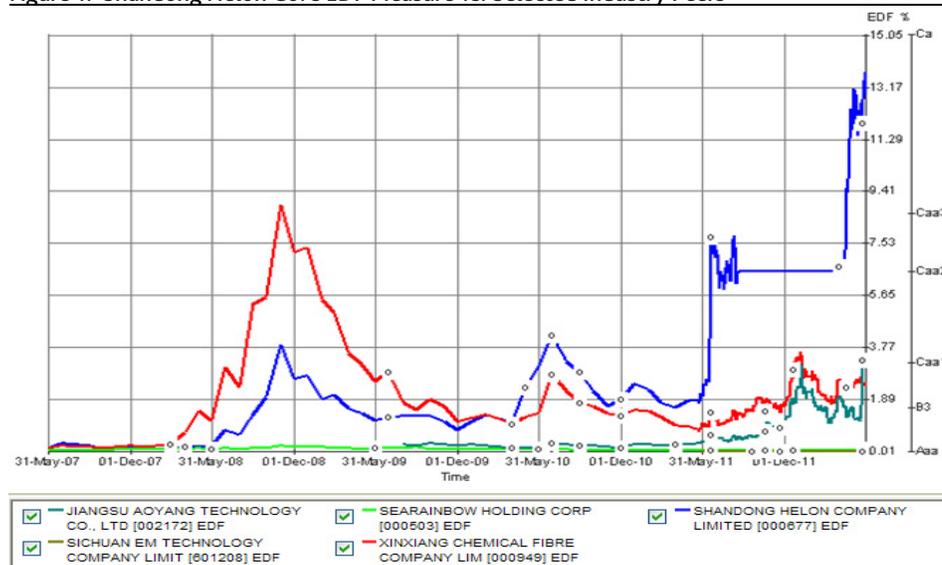
# Shandong Helon Company Ltd.

## China's First Public Debt Default Averted After Rescue

### Summary

- Based in Weifang, China, Shandong Helon Company Ltd. is a producer and distributor of chemical fibers. In January 2012, Shandong Helon missed CNY 397 million in loan payments, raising investor concerns about a possibility of a default. The slowing growth rate of China, the world's second-largest economy, has added to investor concerns. In April 2012 the Weifang government stepped in to help repay Helon's CNY 400 million maturing commercial paper, averting what would have been China's first public debt default.
- Shandong Helon's one-year EDF™ measure first showed signs of heightened risk of default in 2008 during the global financial crisis. In 2010 its EDF measure began to trend in a range suggesting heightened risk of default, and in June 2011 its EDF measure jumped from 2.6% to over 7%. Helon's EDF measure jumped again in April 2012 to over 10%.
- Shandong Helon's near-default experience was caused by both rising financial risk and worsening operating performance. The heightened level of Helon's EDF measure can be understood in terms of the changes in its two primary drivers: market leverage and asset volatility. From May 2008 to May 2012, the firm experienced a 173% increase in market leverage and a 17% increase in asset volatility.

Figure 1: Shandong Helon Co.'s EDF Measure vs. Selected Industry Peers

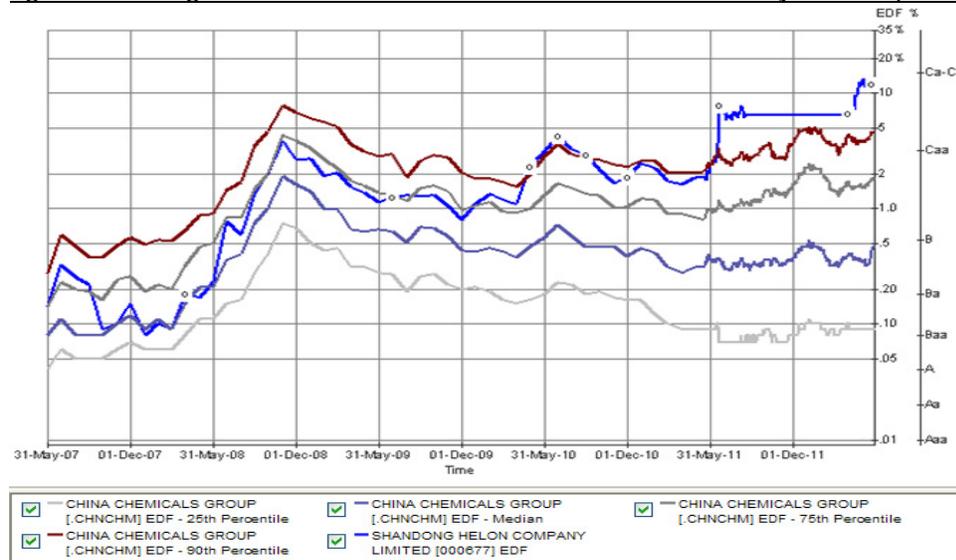


### Early Warning Signs of Financial Distress and Default Risk

Shandong Helon Co. narrowly averted becoming China's first public debt default after a bailout by local government authorities allowed it to repay CNY 400 million of maturing commercial paper in April. The maker and distributor of chemical fibers, based in Weifang, China, has experienced a decline in its operating performance and a rise in its financial risk over the past four years, the pace of which accelerated sharply in mid-2011. Although the company managed to avoid an event of default, its fundamental credit quality continues to be poor, and the likelihood of a credit event in the future remains high. Because Helon lacks a credit rating from an international credit rating agency<sup>1</sup> and does not have traded bonds or CDS from which to infer risk from market spreads, Moody's Analytics' public EDF model provides a unique tool to assess the credit risk of the company. And because it uses equity market information (among other data), the EDF measure for Helon adds transparency to the relatively closed Chinese corporate credit market, and has proved to be a timely early warning signal of financial distress.

The Expected Default Frequency (EDF) measure for Shandong Helon Co.'s has signaled a high level of default risk since the time of the financial crisis in 2008. As Figure 1 on the cover of this report shows, Helon's EDF measure increased from 0.08% at the end of 2007 to 2.73% by the end of 2008. In 2010 its EDF measure began to trend in a range suggesting heightened risk of default. Concern about the company's credit quality was raised by slowing growth in the Chinese economy, and Helon fell into distress as the prices of raw materials rose. In June 2011 its EDF jumped from 2.6% to over 7%. Helon's problems deepened in December 2011, when it announced adjustments to its financial statements showing combined losses of CNY 1.37 billion from 2008 to 2011 – twice as much as previously reported. Trading in Helon's shares (which is listed on the Shenzhen Stock Exchange) was suspended from August 2011 to March 2012 on allegations that the company was violating Chinese securities laws. After its shares resumed trading in March 2012, its EDF measure jumped again to over 10% in April. Helon's current EDF measure stands at 13.2%, which is equivalent to a Ca implied rating. Company filings show that Helon remains behind on about CNY 900 million in bank loans. Several of Helon's creditor banks, including China Everbright Bank, China Merchants Bank, and Shenzhen Development Bank, have sued the company for repayment of outstanding loans. To date, no judgments have been issued.

**Figure 2: Shandong Helon Co's EDF measure vs. EDF Distribution of its Industry Peer Group**



On April 15, 2012 – the date of maturity of its unsecured commercial paper – Helon's EDF metric was 9.11%, which was significantly higher than most of its industry group peers like Searainbow Holdings Co. and XinXiang Chemical Fibre, as we show in Figure 1. In fact, Helon has underperformed its entire industry peer

<sup>1</sup> Helon is rated by China Lianhe Credit Rating Co., Ltd., a major domestic agency.

group since 2008. Figure 2 shows the median, 25<sup>th</sup>, 75<sup>th</sup>, and 90<sup>th</sup> percentiles of the EDF for Helon's industry peer group, the China chemicals group, in addition to the level of Helon's own EDF measure. On April 15, Helon's EDF measure was 23 times greater than the median EDF measure for its industry sector. In the year leading up to its bailout, Helon's EDF measure increased by almost 400%, from 1.86% in April 2011 to 9.11% in April 2012. Furthermore, the increase in Helon's EDF measure was in sharp contrast to the changes in the median EDF level for the China chemicals group, whose EDF metric declined by 25% over the same period. Although the level of Helon's EDF measure was sending clear signals about its rising risk of default, its poor performance relative to its industry peers was an additional red flag.

Moody's Analytics' research has shown that firms that underperform their industry sectors, regardless of the level of their EDF measure, experience higher default rates. Based on data from 1992 to 2011, we calculated one-year default rates conditioned on a firm's EDF level and on the relative EDF change versus its sector. Relative performance is measured by the difference in the change in a firm's EDF measure and the change in its industry median EDF measure. Figure 3 shows the results. For ease of presentation, we bucketed EDF levels and change versus sector into ten equally sized categories (deciles). Hence, the trend of Helon's EDF measure versus its industry group showed the heightened risk of default for the company.

**Figure 3: Average Realized Default Rates by EDF Level and Relative Performance vs. Industry Sector**

		EDF Change Relative to Industry Peer Group Change										
		1	2	3	4	5	6	7	8	9	10	ALL
Firm EDF Level	1	0.05%	0.03%	0.02%	0.00%	0.00%	0.01%	0.03%	0.00%	0.00%	0.00%	0.02%
	2	0.10%	0.05%	0.06%	0.06%	0.00%	0.00%	0.02%	0.07%	0.11%	0.27%	0.05%
	3	0.10%	0.06%	0.01%	0.03%	0.01%	0.03%	0.07%	0.06%	0.03%	0.18%	0.05%
	4	0.28%	0.12%	0.17%	0.15%	0.09%	0.10%	0.08%	0.09%	0.17%	0.30%	0.15%
	5	0.32%	0.23%	0.24%	0.32%	0.22%	0.24%	0.21%	0.27%	0.22%	0.46%	0.27%
	6	0.62%	0.44%	0.45%	0.34%	0.44%	0.56%	0.44%	0.72%	0.51%	0.97%	0.55%
	7	0.71%	0.56%	0.66%	0.80%	0.64%	0.72%	0.73%	1.06%	1.18%	1.63%	0.89%
	8	1.01%	1.01%	1.19%	1.25%	1.27%	1.44%	1.58%	1.65%	2.05%	3.10%	1.68%
	9	3.14%	2.22%	4.83%	5.16%	5.25%	4.34%	4.87%	5.75%	6.37%	8.39%	5.60%
	10	6.43%	4.68%	5.76%	7.70%	7.70%	6.96%	7.67%	9.31%	9.99%	13.70%	8.94%
All	0.66%	0.63%	1.08%	1.73%	1.73%	1.83%	2.24%	2.92%	3.13%	5.96%	2.16%	

#### Undone by Rising Financial and Business Risk

An analysis of the drivers of the Helon's EDF metric sheds additional light on how and why the company became financially distressed and ultimately needed a bailout to repay its debt. In this section we examine the drivers of Moody's Analytics' EDF model and how the EDF measure reflected the deterioration in Helon's credit quality. The EDF model shares many of the same basic approaches to measuring credit risk as fundamental credit analysis. Both approaches can be traced back to the analysis of company balance sheets, and they share common economic intuition in determining a firm's credit worthiness. The key difference between the two lies in their valuation principle – market value-based for EDFs versus accounting value-based for fundamental analysis.

Moody's Analytics' public firm EDF model belongs to a class of credit risk models referred to as structural or asset value models. The basic assumption of asset value models is that there is a causal, economically motivated reason that default occurs. Default is highly likely to occur when the market value of the firm (the sum of the value of its market capitalization and debt) is insufficient to cover its liabilities due at some future date – i.e. firms tend to default when they are insolvent. This follows from the fact that equity holders are residual claimants on the value of the firm. If the market value of the firm is negative, equity holders can and often will "put" the residual value of the firm to creditors.

The above economic intuition can be translated into three quantifiable variables: the expected value of a firm's assets ( $A$ ), the volatility of its assets (denoted by  $\sigma$ ), and its default point,  $X$ . The default point is derived from a firm's short and long-term liabilities, and reflects the notional debt payment due that would trigger a default. The interaction of the three variables is encapsulated by the firm's distance-to-default ( $DD$ ) which, under some largely innocuous assumptions, can be expressed as:

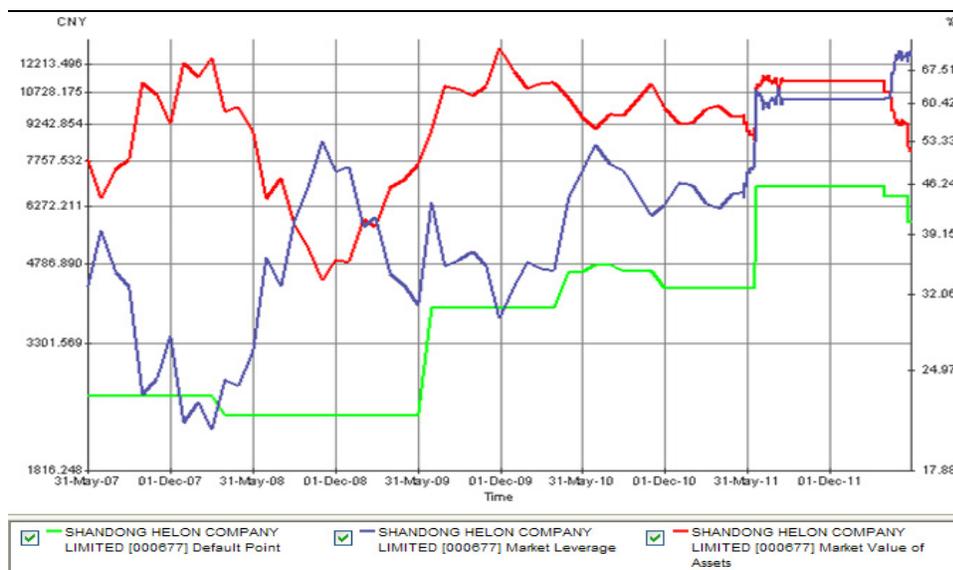
$$DD \approx (\ln(A) - \ln(X)) / \sigma$$

This simple equation essentially states that a firm's relative credit risk (measured by *DD*) is a function of its financial risk and its business risk, two factors that are core concepts of fundamental credit analysis. The numerator of the above equation measures market leverage – i.e. financial risk. All else equal, higher leverage decreases *DD* and hence increases the probability of default. The denominator of the *DD* equation can be viewed as business risk. Firms in industries with high asset volatility tend to exhibit higher risk of default, all else equal. In contrast, fundamental credit analysis cannot measure these economic drivers of default risk directly – the accounting value-based financial ratios are at best viewed as their proxies. Once we have calculated a firm's *DD*, we can derive its probability of default (its EDF measure) by looking at the historical average default rate consistent with each *DD* level.

Helon's near-default experience was caused by both rising financial risk and worsening operating performance (equivalently, rising business risk) over the past four years. In Figure 4 we show how its financial risk increased starting in 2008. The graph shows the time series of the company's market value of assets, its default point, and its market leverage. Market leverage summarizes a firm's financial risk, and is simply the ratio of a firm's default point to its market value of assets. In early 2008, Helon's market leverage began a sharp increase, driven by a decline in the market value of the firm's assets. In the early 2010, the equity market responded to the company's increasing troubles by bidding the value of its shares lower, leading to a yet another reduction in the market value of its assets.

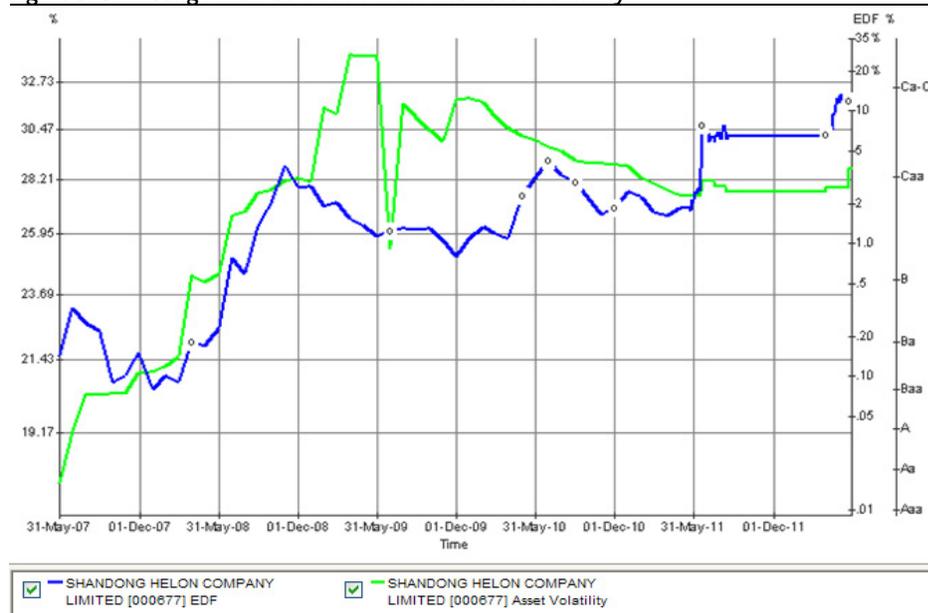
Helon's default point jumped in 2009, which in turn led to an increase in the firm's market leverage. Its market leverage rose by 72%, from 26.40% to 45.78%, between May 2008 and May 2011. Market leverage remains extremely high at its current level of 71%, higher than 85% of all large Asian corporate firms. During the same period Helon's default point also increased by 81%, from CNY 2,355 million to CNY 4,296 million. The current level of Helon's market value of assets puts it very close to its default point of CNY 5,827 – on a market value basis, the company is just barely solvent. 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.

**Figure 4: Shandong Helon Co's Market Leverage and Market Value of Assets**



Worsening operating performance also helped drive up Helon's probability of default. Helon's asset volatility, which is the standard deviation of the annual change in the market value of assets, increased at the same time that its market leverage was increasing (shown in Figure 5). From 2007 to mid-2009, Helon's asset volatility – its' business risk – increased sharply from 18% to nearly 35%. The combination of higher leverage and higher asset volatility led to a sharp drop in its distance to default and a material rise in its EDF measure. Helon's current asset volatility level of 28.69% is beyond the 75<sup>th</sup> percentile of firms in the South East Asia large corporates group.

Figure 5: Shandong Helon Co's EDF Metric and Asset Volatility



### Summary

The EDF measure for Shandong Helon Co.'s has signaled a high level of default risk since the time of the financial crisis in 2008. In 2010 its EDF measure began to trend in a range suggesting heightened risk of default, and in June 2011 its EDF jumped from 2.6% to over 7%. Its EDF measure jumped again in April 2012 to over 10%. The fact that Helon remains behind on about CNY 900 million in bank loans, and that its current EDF measure stands at 13.2% (equivalent to a Ca implied rating) indicates that the likelihood of a credit event in the future remains high.

One of the telling signals of default risk for the firm was the relative performance of its EDF measure against that of its peers. At the time of the maturity of the firm's commercial paper on April 15, Helon's EDF measure was 23 times greater than the median EDF measure for its industry sector. In the year leading up to its bailout, Helon's EDF measure increased by almost 400%, which was in sharp contrast to the changes in the median EDF level for the China chemicals group, whose EDF metric declined by 25% over the same period.

The severe and protracted deterioration in Helon's credit quality can be understood by the changes in the drivers of its EDF measure, market leverage and asset volatility. The trends in both of these measures over the past four years shows that Helon's financial risk increased at the same time that the company's operating performance began to worsen. From May 2008 to May 2012, the firm experienced a 173% increase in market leverage and a 17% increase in asset volatility. The trends in the fundamental drivers resulted in the sharp, sustained increase in the levels of its EDF measure.

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